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ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXVIII. No. 3320 JULY 11, 1941 SIXPENCE

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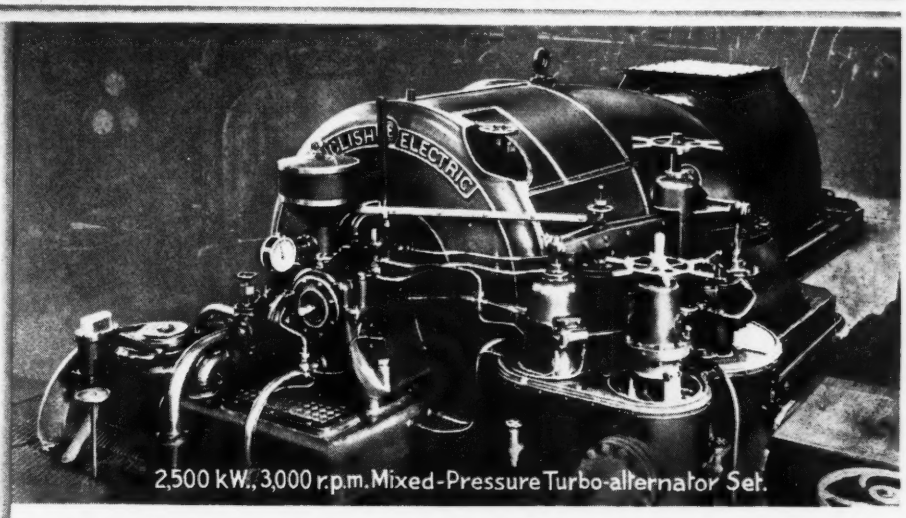

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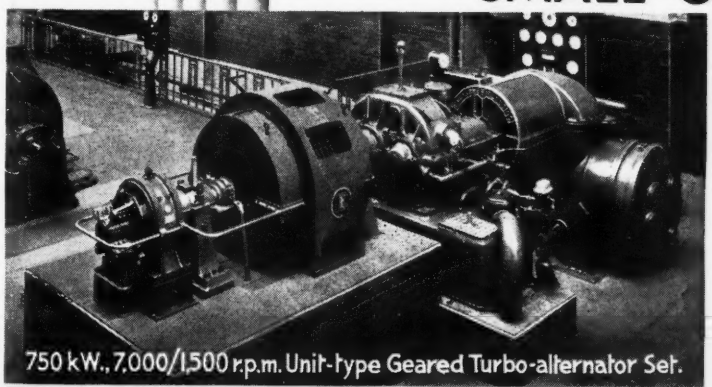
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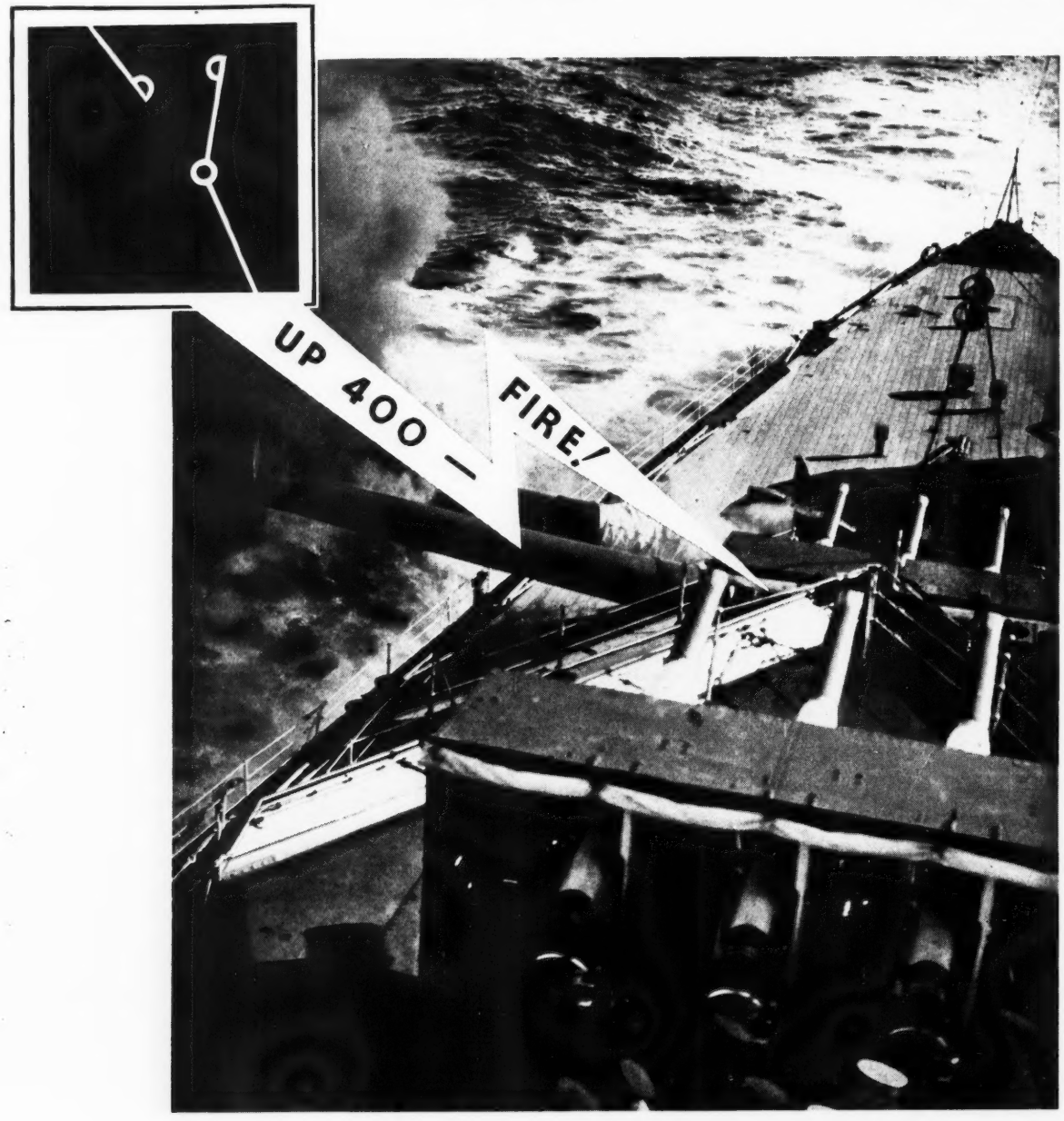

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THE
ELECTRICAL REVIEW

Volume CXXVIII — No. 3320

Friday, July 11, 1941

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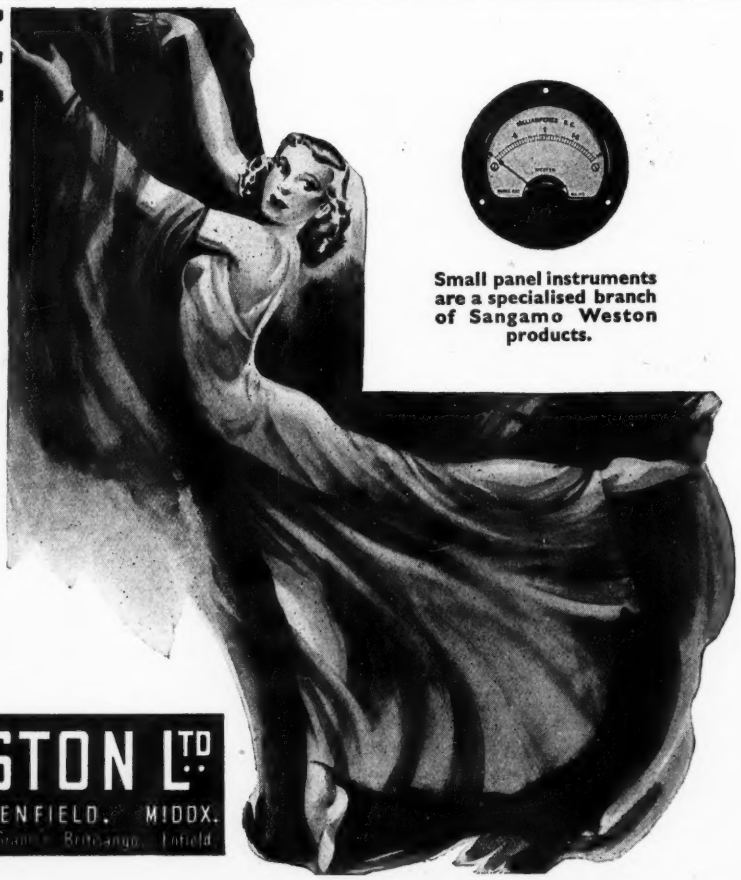

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THE
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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVIII. No. 3320 JULY 11, 1941 Price SIXPENCE

Scientific and Technical Men

Is Organisation Possible and Desirable?

QUITE a stir has been caused among some of our readers by the publication in our June 6th issue of a report of a meeting of the Association of Scientific Workers. The correspondence was opened by a " Professional Engineer " who, by implication, chided us for not putting a spoke in the Association's wheel. He maintained that all technical and scientific progress had been achieved by sturdy individualism and to introduce trade-union methods meant stagnation and decay. He was supported in his contentions by " Another Engineer."

These letters roused the other side to action. They asserted that tanks could only be countered by tanks: in other words, the organisation of employers had to be met by corresponding organisation of employees. We suspect that the views of both parties are not entirely untinged by political considerations and we are skating over thin ice when we endeavour to get at the truth of the matter without crashing into the whirlpool below the surface.

Employers' Objects

Hard things have been said about employers' organisations, but we hold the opinion that they are not so sinister as some people would have us believe. They were certainly formed primarily for mutual protection, but not necessarily against their employees. Their worst enemies are frequently members of their own industry who indulge in unfair trading practices—including as a rule wage-cutting.

So far as the electrical industry is concerned, it is hardly true to suggest that any association was formed with the object of combating employees' striving for better wages and conditions. Where the settlement of such conditions became one of their functions it was to regularise them, not to reduce them. Naturally if they declined to accede to the full demands of their workers (usually pitched fairly high for bargaining purposes) they were accused of niggardliness—or even of callousness—but on the whole workers in the electrical industry have had little to complain of, relatively speaking.

If at first employers looked askance at employees' trade unions, while thoroughly convinced of the righteousness of their own, they soon came to see that their industries could be operated much more smoothly if they negotiated with an accredited body. It was only the unenlightened who considered that bargaining with individuals or small groups was more satisfactory, and their bargains were often hard.

We will not deny that it needed pressure from the trade unions to bring about this position and it was not achieved without bitterness on both sides. Nor will we pretend that this method of negotiation always proceeds smoothly, but we will maintain that conditions in modern industry would be chaotic without organisation of both employers and employed.

So far we have considered only the organisation of craftsmen, or manual workers, whose work is of a more or less " standardised " character. Professional and technical men vary widely in their knowledge and functions. In the case of power station staffs a fairly successful working arrangement has been arrived at, although the National Joint Board Schedule is by no means a perfect instrument for ensuring payment according to ability and responsibility. Nevertheless something has been accomplished, and as the Electrical Power Engineers' Association is stated to have " friendly relations " with the Association of Scientific Workers, we are led to believe that the organisation of technical and scientific men is not impossible, although its desirability may be a matter of opinion.

Individualism Outmoded

Here we must revert to the asseveration that all scientific progress has been on individualistic lines. This may have been true in the past, but with the increased tempo of the last two or three decades it has lost much of its force. Scientific investigation has been organised and most modern advances have resulted from the collaboration of scientists under, no doubt, the leadership of the most brilliant (to employ the usual adjective). This has enabled men who are by no means geniuses to contribute a great deal to the development of new ideas.

Much of the credit for the formation of such teams is due to individual manufacturers and to manufacturers' organisations; the E.R.A. may be cited as an example. All this has found employment for many scientific and technical men and, in fact, has created a " new arm " in industry. It is, however, an arm in which salaries and conditions have not been regulated—there seems to be

no standard for the purpose. In many directions, notoriously in Government service, remuneration is pitifully inadequate and we cannot blame these men if they endeavour to secure by organisation conditions which they cannot gain individually.

It may be, too, that employers would welcome some guidance in this direction. We believe that all enlightened employers are anxious to treat these men justly, but have no means of assessing their "market value." If any organisation can suggest reasonable terms we feel sure that they will be only too glad to give proper consideration to them.

We are afraid that the task of drawing up definite rules for the classes of men (and women) which the Association of Scientific Workers seeks to enlist is an extremely difficult one, but we see no reason to object to the Association's endeavours. We cannot regard such activities as "subversive" and have no fear that they will result in stopping or slowing down scientific and technical achievement.

E.P.E.A. and T.U.C.

WHILE on this subject, it is very interesting to read in the June *Electrical Power Engineer* a report of a debate at a meeting of the National Executive Council of the E.P.E.A. upon the subject of affiliation to the Trades Union Congress, when it was decided that a postal ballot of the membership should be taken on the question. Most of the speakers favoured the step but Mr. W. J. Oswald was strongly against it and urged instead support of the National Federation of Professional Workers. His principal argument was that members were neither employers nor rank and file; they formed a middle party with their own special problems. The proposer of the motion (Mr. Telford), in the course of his reply, mentioned that more than 75 per cent. of the members of the Federation were affiliated to the T.U.C. Without going into the merits of the particular point at issue we may say that between the individual organisations (such as the E.P.E.A.), the Federation of Professional Workers and the A.S.W. there seems to be a risk of confusion and overlapping.

Home Guard in Industry

MEMBERS of the Home Guard allocated to the protection of industrial establishments must have a knowledge of the layout of those establishments and it is, of course, desirable that they should also know something of their operation. It is thus essential that Home Guard units should consist of men employed at these works. This is particularly the case with electricity undertakings which embody many "mysteries" for the layman, as well as lurking dangers to the curious uninitiated. Having enrolled the men and instructed them in their duties it is most undesirable that they should be taken from their posts for general duties elsewhere. One of the functions of the Factory Liaison Officers, whose appointment is reported in this issue, will be to guard against this kind of thing. They will also relieve the Electricity Commissioners of the work of dealing with problems and suggestions relating to the Home Guard at electricity works.

Portable Tools

IN many industrial operations, accidents arising out of the use of electrical apparatus may be due not so much to shock itself as to the consequences that may follow a slight but unexpected shock that would be harmless in different circumstances. This is often the case with portable tools. In this issue particulars are given of a scheme of earth leakage protection which has been introduced into a number of factories and which appears to obviate most of the difficulties in a simple manner. It permits the use of standard plugs and sockets and does not interfere with existing over-current protection. It has, however, the disadvantage that a breakdown of one tool may result in the interruption of supply to a group of tools, but this is likely to be of infrequent occurrence and should not take long to rectify. The taking of a chance of stoppage appears to be justified in the interests of safety.

American Technical Aid

AFTER hearing so much of a general character about the call to American citizens to come over and help us with their technical skill, readers will be interested to have some concrete details of the scheme; these appear on another page of this issue. The level of knowledge and experience demanded of applicants for enrolment in the Civil Technical Corps varies widely between the various classes. For instance, electricians are required to be something of Admirable Crichtons in the electrical way. On the other hand, although the duties of marine electrical artificers appear to include many highly-skilled jobs, it is considered that while electrical experience is preferable it is not essential in their case, as intelligent applicants can acquire electrical knowledge after enrolment.

Cement and Plaster

THERE appears to be a common impression abroad that a plaster is something that is inferior in strength and performance to a cement. Actually all hemi-hydrates are properly designated "plasters" and they may be better than cement for certain electrical purposes, such as securing metal inserts in thick-walled porcelain insulators. Comparisons between the two are drawn in a new E.R.A. Report, G/T131 (1s. 10d. post free), in which Mr. A. P. Paton deals with data that has become available since the issue of a previous Report (G/T114) in 1939, on the subject of calcium sulphate and other types of cement for glass inserts in flameproof enclosures. Some new information is given on litharge and glycerine cements and iron cement. General questions relating to hydration of calcium sulphate cements are also dealt with. Further evidence is yet required, however, before it can be determined whether the plaster which has been found satisfactory for the purpose mentioned will also prove superior for such applications as fixing glass inserts in flameproof gear.

Gas—from a Commissioner

AT a recent Edinburgh "gas" luncheon a District Commissioner for Civil Defence said that on many points gas had electricity beaten. While electricity seemed to him to have a severely limited field, gas engineers had shown that there was no limit to the gas industry. As one avenue was closed another opened. It was a native industry which drew its raw material from the country in which it operated. What we wish to know is who (or what) closed those avenues and where the worthy Commissioner thinks the electricity supply industry gets its coal from? We might also suggest that it is no part of a Civil Defence Commissioner's duties to give one industry a boost at the expense of the other. But perhaps he was not told of the "truce."

What we Meant

IN commenting on Mr. J. Mortimer Hawkins's article on the organisation of electrical contractors in our issue of June 20th we said that his proposals were of a somewhat grandiose nature. The author considers that in using the word "grandiose" we dismissed the scheme as merely ridiculous but we certainly did not mean to do so. It all comes about from the wide interpretation which the word can have. Chambers's 20th Century Dictionary gives its meaning as "grand or imposing; bombastic" and the "Concise Oxford" definition is similar. It was in the first sense that we used the word.

Boiler Economy—1

Water, Coal and Air Feeding

The outstanding feature of modern boiler plant developments is the endeavour to increase the output and efficiency of existing plant. This article, the first of three, deals with feeding considerations

INQUIRIES from many of our readers have shown that there is an urgent need for a review of boiler plant developments, and the greatest interest lies, for the time being, in the possibilities of increasing the outputs and efficiencies of existing plant. We have therefore planned to publish three articles on boiler economy dealing with boiler feeding, boiler measurements, and automatic and remote boiler control.

Feeding the large modern boiler demands some hundreds of horse-power, so that a slight fall or gain in the efficiency of operation can have quite a considerable effect upon the financial balance sheet.

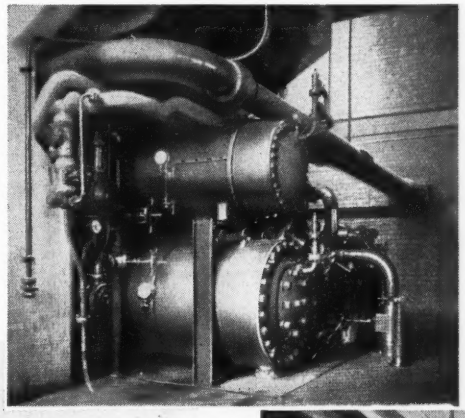
The centrifugal feed pumps can operate, without special consideration to design, at two widely different capacities at the same discharge pressure, and when the actual quantity required by the boilers is between two such capacities surging may result. To permit satisfactory parallel operation the pressure-capacity characteristic should be such that the pump discharge pressure is at the maximum when no water is flowing and falls continuously as the water flow is increased. Pumps with similar pressure-capacity characteristics share the load in proportion to their respective maximum capacities, and it is necessary for the stand-by turbo-feed pumps to operate in parallel with the motor-driven feed pumps and with each other. The fall in pressure from no-load to full-load should be reduced to a minimum, and 10 per cent. is considered to be a desirable figure.

Where the pressure in the suction of a feed pump is maintained by a condensate or booster pump, failure of the latter should be guarded against by a direct supply of water to the suction of the feed pump, which can be arranged for by connecting the feed tank direct to the feed pump with a non-return valve in the pipe line. With a regenerative feed-heating system it is necessary to consider the pressure-capacity characteristics of other pumps in series with the feed pump and of the feed system.

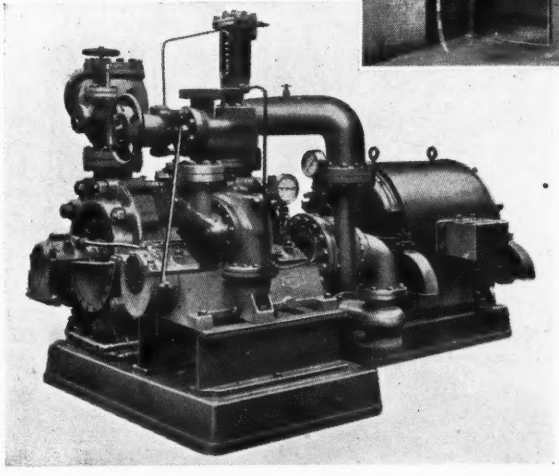
In view of the high capital cost of feed heaters constructed to withstand the pressure on the discharge side of the feed pump, considerable economy can be effected by dividing the feed pump into two units operating in series and with a common drive, the heater being arranged in the pipe line between the discharge branch for the first unit and the suction branch and the second unit, so that the heaters only have to withstand the intermediate discharge pressure.

A simple and reliable solution of the problem of unnecessary excess pressure across the feed regulators is the Weir turbo-electric feed pump with its turbine booster pump operating in series with a constant-speed motor pump. A practically constant pressure is maintained in the feed line at all loads, the motor-pump doing the bulk of the work while the turbine-pump looks after the variable component of the duty.

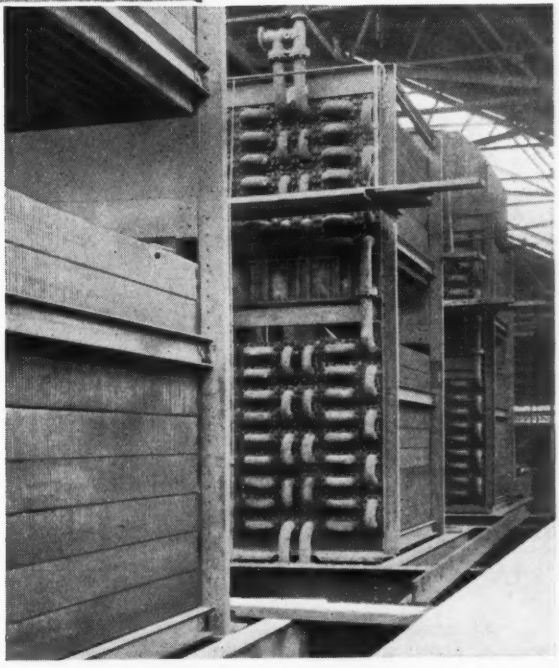
The attainment of a stable head-quantity characteristic with a pressure line at reduced output rising steadily to cut-off point seems to have been the objective in the design of the latest centrifugal boiler feed pump by Worthington-Simpson, Ltd. Instead of the usual consecutive arrangement of impellers, which involves the use of a balance disc and leak-off, the



A bled-steam heater at a large power station



A simple and reliable solution of the problem of excess pressure across the feed regulators is the turbo-electric feed pump ; a 250,000 lb. per hour equipment



The H-gilled tube gives a virtually self-cleaning economiser heating surface. A large industrial installation

stages are looped and carry from the outside ends of the pump to the final stage in the centre, thus affording a hydrostatic balance.

In referring to the centrifugal feed pump as lending itself much more easily to automatic control than the reciprocating pump, Holden & Brooke, Ltd., claim for their multi-stage and single-stage centrifugal pumps that their maximum pressure is a limited one and no damage can be caused as the result of failure of the automatic control at any time while the feed is steady. For feeding more than one boiler, even at different pressures, by only one pump, the "Pumry" automatic control valve has been introduced. This is designed to ensure that no matter what pressure-drop may occur in the system, pump discharge pressure will not fall below the adjusted valve pressure and, in consequence, necessitate capacity and driving-power increases.

No doubt the biggest economic advance in water feeding has been feed water heating by bled steam. With a view to the elimination of such feed-water heater troubles as the frequent and sometimes inexplicable failure of the ordinary brass tubes, the Weir "Multiflow" heater employs solid-drawn copper tubes securely expanded into cast-iron headers, thus avoiding the leakage inseparable from the use of ferrules. The entire element of heating tubes is free to expand, being held only at the upper or valve chest end, while the passage of the feed water through the tube is arranged to secure the greatest possible heat transmission. We believe that the H. & B. heater was the original multi-flow heater with the floating header principle, and the makers stress the necessity of using only straight circular tubes in order to avoid the scaling and consequent cleaning difficulties associated with tubes of irregular shape.

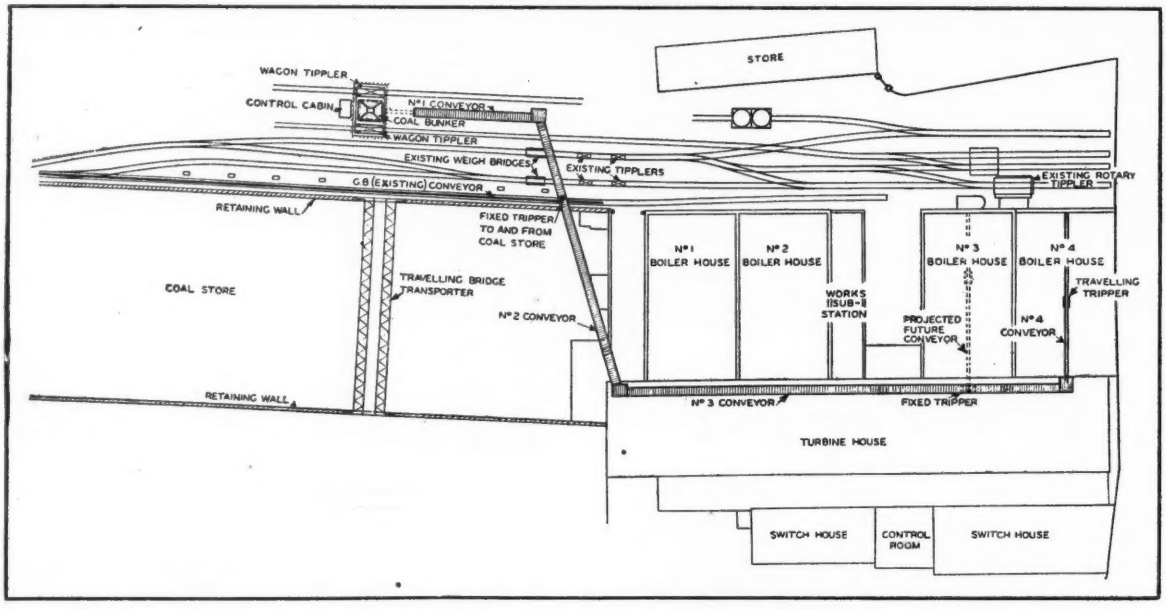
The economiser is, of course, a feed water heater, the hot flue gases being the heating medium in this case. In the "Premier Diamond" economiser the tubes or elements are arranged in very shallow tiers, with ample inspection space between the tiers, ensuring a comparatively short gas travel through each tier of tubes and incidentally giving much better visibility during inspection. The tube cross-section gives the 100 per cent. visibility now demanded by the latest Factory Regulations. It is impossible to crush the joint ring of the pressure joints because when the ring has been compressed to the required amount the faces of the two collars on the bend and element are brought into firm contact. All the joints are external to the gas chamber, and because every tube element is supported and is free to move independently of adjacent elements, trouble due to sudden changes of temperature is totally eliminated. Further, the tube is protected through its whole length inside the gas chamber.

The demand for a form of economiser heating surface which would be virtually self-cleaning and allow no dust to accumulate resulted in the design of the H-gilled tube by Senior Economisers, Ltd. The gas passages formed by the gills are straight and of uniform cross-sectional area throughout. The gases flow vertically across plain surfaces without change of direction and are, therefore, subject to the minimum loss of draught, while the conditions which favour deposition of dirt are avoided. When the elements are assembled horizontally the fins of adjacent tubes abut, forming oval-shaped gas passages which are straight and uniform throughout their length.

In the Heenan "Twintube" economiser the bends are replaced by connector boxes machined from solid mild-steel billets which connect the tube elements in pairs, giving a twin flow of water. The straight gas passages permit a gas velocity high enough to prevent dust deposition under normal conditions. This velocity does not involve excessive draught loss which is usually in the neighbourhood of 0.75 to 1.5 in., with a gas speed of 40 to 70 ft. per second.

Coal Feeding

The economical operation of any boiler depends very considerably upon efficient combustion. In recent years water walls and suspended refractory air-cooled walls have become standard combustion practice, with the result that the front arch is usually much shorter, and this often calls for a corresponding increase in the length of the rear arch. It is now found that with the rear arch, covering as it does a fairly large portion of the grate forward of the dumping bars, the conditions are more severe than they used to be, and consequently the "Liptak" double suspended construction is now employed extensively.



The coal-handling system described in the article

Further, because of the increased height of water-tube boiler settings, suspended refractory walls, either air-cooled or insulated, offer advantages over the older type of solid fire-brick walls. If absolute air-tightness is required, coupled with ease of replacement, the "Bigelow" suspended wall has the advantage that each refractory block in the construction is independently supported and has adequate expansion allowance.

In these days it is difficult to justify the wasting of surplus blast-furnace or coke-oven gas, and this, coupled with the present coal supply difficulties, makes it necessary to seek an alternative to solid-fuel firing wherever possible. A sound scheme is presented by mechanical-stoker or pulverised-fuel firing automatically for a constant output of steam, say, a base load, while the peak and variable loads are catered for by blast-furnace gas firing. Such a scheme must,

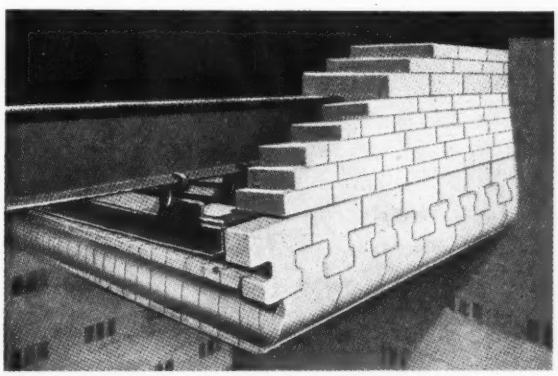
however, be modified according to the availability of the gas.

It is a comparatively simple matter to adapt the necessary burner for auxiliary firing for water-tube and other boilers. Such a burner is the "Gako" low-pressure gas equipment, which is available for both primary and auxiliary firing and has special arrangements for alternative oil firing or for firing with two gases, with or without preheated air and under natural, induced or forced draught.

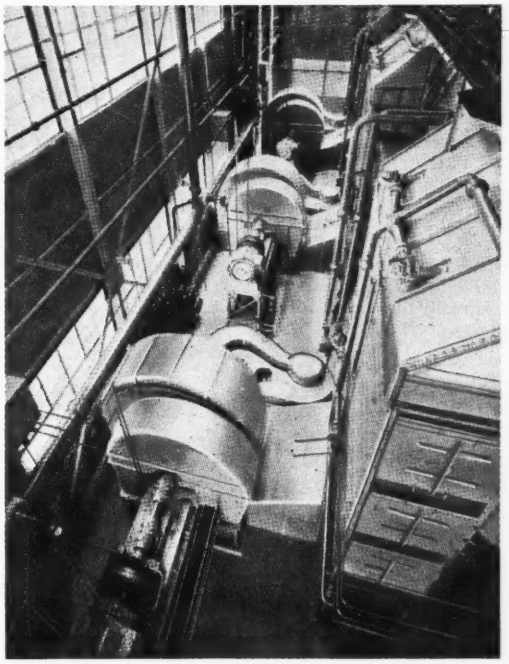
Efficient coal handling has, of course, a great bearing on the economical running of any power station, but it is almost impossible to refer to any equipment as a scheme without regard to the particular site requirements, on which so much of the design and economical operation depends. We therefore very briefly describe in the following notes the system erected at a large and modern power station by Mavor & Coulson, Ltd., as part of extensions involving six 160,000-lb. per hr. boilers.

Rotary twin tipplers empty the wagons into a 50-ton concrete bunker with an outflow on to a feeder which has interlocking trays which carry the material without any side rubbing. From the feeder the material is taken by No. 1 belt conveyor, which rises to the roof of the turbine house, passing between two runs of existing gravity buckets. The new No. 2 belt conveyor can be supplied from the store through the upper run of gravity buckets or by means of the fixed tripper it can deliver to the lower run of gravity buckets for putting coal into the store, in which case the buckets are filled, in turn, by a rotary feeder.

When the wagon tipplers are supplying the boiler-house direct the coal passing over the fixed tripper on No. 2 conveyor is directed by a valve-plate back on to the belt instead of being diverted down the chute to the gravity buckets. The third belt conveyor is carried over the roof of the turbine house and is 395 ft. long. It delivers to a fourth belt conveyor for distribution to the bunkers that run the full length of the new No. 4 boiler house. The coal is discharged to either side by a travelling tripper which is moved when required by power from the belt. Much weight has been saved in the structure by inverted troughing which carries the idlers and keeps the return belt clean. The first three belts are 36 in. wide, run at about 300 ft. per minute, and convey about 300 tons per hour. The belt passing over the travelling tripper is 30 in. wide and has a speed of 325 ft. per minute.



The double suspended construction is now used extensively



The balanced-draught system is extremely flexible: the induced-draught component of an industrial installation

Coal and ash handling, particularly the latter, often involves transport over long distances for which the usual conveyor systems are not always suitable and an aerial ropeway is indicated. The urgent need of the moment to conserve man-power renders it essential that the loads of ashes should be automatically tipped on the dumping ground and that the empty carrier should automatically return without manhandling in any way.

To meet these requirements R. White & Sons recommend the bi-cable system, in which the loaded carriers travel along a fixed rope by means of travelling supporting sheaves that run on the rope itself, a separate and lighter rope being used to haul the carriers from one of the lines to the other, around the return terminal and back again to the loading point. The loads are tipped anywhere along the route entirely automatically, so that the carriers are never touched by hand from the time they leave the loading berth until they arrive back again empty and are automatically detached from the hauling rope and stand ready for loading again.

"Wet" ash-removal schemes often provide a solution for the economic problems involved, but high maintenance costs on account of abrasive wear on the impellers and sideplates of pumps has been a drawback. Among the various schemes adopted to overcome this difficulty is the "Pulsometer" slurry pump, in which adjustment for wear on the impeller vanes can be made without dismantling the pump, and the initial efficiency and output of the pump are maintained over long periods.

Air Feeding

Present-day rates of combustion and the introduction of many economy devices call for substantially higher fan pressures, and in consequence one fan plant alone would be impracticable on account of excessive rating requirements, probable excessive air infiltration and positive pressure in the combustion chamber. Instead, therefore, the load is handled by two fan plants, the forced-draught fans dealing with the air supply to the furnace while the induced-draught fans handle the gases of combustion. In addition to permitting the fuel to be consumed under the most favourable conditions the balanced-draught system is extremely flexible and allows for a large range of boiler duties.

The constructional features of the main classes of cased fans for mechanical draught, namely, the forward-blade, backward-blade and radial-blade fans, change as the blade inclination changes from one extreme to the other. The weight of the forward-blade fan for a specified duty is a minimum compared with that of the backward-blade fan. Forward-blade fans are characterised by economies in power consumption for duties below the normal rating. Radial-blade fans secure a reduction of the difference between the power absorbed at maximum efficiency and that absorbed at free discharge. High values of mechanical efficiency are attained with the backward-blade fan, with which the point of maximum efficiency closely corresponds to the point of maximum input.

The mechanical constructions of the various classes of "Sirocco" fan wheels generally follow similar lines. The fan blades are riveted at their ends to a disc plate and outer binder ring respectively, and the disc plate has also riveted to it a cast-iron cone disc which is bored and keywayed to suit the fan shaft.

Good output regulation is essential to ensure efficient parallel operation of fan plants, and a method which combines

the advantage of constant speed with simplicity of control is afforded by the Howden system of vane control. In this the fan is driven by a single- or two-speed squirrel-cage motor and the output is controlled by changing the constant-speed characteristic of the fan so that it actually passes through the desired working point. This is attained by creating and varying at the inlet to the fan a swirl in the direction of rotation and concentric with the fan wheel by means of a set of pivoted vanes arranged in the inlet which work in a similar manner to the guide vanes of a hydraulic turbine. For each position of the vanes a new constant-speed characteristic is obtained. As the vanes close the pressure-volume curve becomes more steep and the conditions of stable operation are much improved.

In the " Sirocco " fan inlet control gear system regulation is accomplished by imparting angular velocity to a portion of the air or gas entering the fan eye in the direction of rotation of the fan wheel. The gears are suitable for local or remote control. They may be operated manually or electrically, and a number of fan installations so equipped may be interlocked and regulated automatically according to variation in the draught demands.

Air pre-heating has now reached a stage when the cost of installing the necessary equipment is justified on the score of heat recovered from the flue gases of all large boilers. The Howden-Ljungström air preheater acts as a continuous regenerator in which the heat transfer takes place in pure contraflow.

The elements form the regenerative mass for the transfer of heat from the flue gases to the air and the continuous regenerative effect is achieved by separating the flow of gas and air through the rotor in an ingenious way. The rotor is housed inside a cylindrical shell and the end plates which form the top and bottom of the shell are fitted with sector plates to separate the streams of air and gas. The rotor revolves at 4 RPM, and the heating surface is continually passing from the gas side to the air side of the preheater. The heat which is transferred to the heating surface in the gas side is accumulated by the elements and carried over to the air side.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE retirement of **Major-General A. C. Fuller,** C.B.E., A.M.I.E.E., on retired pay is announced in the *London Gazette*.

Mr. Fred L. Ogden, whose retirement from the position of borough electrical engineer of Oldham was reported in our last issue, has completed forty years' municipal service. Mr. Ogden was educated at Werneth Academy, the Manchester Grammar School and the Manchester Technical School (now the College of Technology). He served an apprenticeship as an electrical engineer in Manchester and then joined the Northwich Electric Supply Co. (now the Mid-Cheshire Co.) as assistant electrician, later becoming

Mr. F. L. Ogden

Mr. E. Binns

engineer in charge with the Harrogate Corporation. He went to the Oldham undertaking in 1902 and two years later was appointed chief assistant engineer. Upon the death of his chief, Mr. W. W. Newington, he was appointed joint engineer and manager with Mr. W. Chamberlain, the mains superintendent. When the latter became tramway manager in 1918 Mr. Ogden took over full charge of the undertaking.

As we have already reported, Mr. R. G. Whitehead, deputy to Mr. Ogden, and Mr. E. Binns, station superintendent, become joint engineers and managers.

Mr. Binns is a native of Greetland, near Halifax, Yorks, and received his early education at the Elland Grammar School, later attending the Halifax Municipal Technical College and the University of Leeds. He served an engineering apprenticeship with a firm of engineers at West Vale, Halifax. His first appointment was as switchboard attendant at Hull in 1913. In 1914 he became charge engineer at Oldham, and subsequently boiler house engineer and station superintendent. He is a corporate member of the Institutions of Mechanical and Electrical Engineers, and has been an active member of the Electrical Power Engineers' Association. He has acted as chairman of the Manchester Section Committee and has served on the No. 3 Area Investigation Committee and on the District Joint Board.

Mr. Whitehead was born in Liverpool and was educated at Wigan Grammar School, Bootle Technical College and Liverpool University. He served an engineering apprenticeship at the White Star Line Works, Bootle, and was for a time a sea-going engineer. In 1904 he was appointed charge engineer in the Wigan undertaking, and he went to Oldham in 1907 as charge engineer, later being appointed mains engineer and subsequently chief assistant engineer under Mr. Ogden.

Mr. R. G. Whitehead

Mr. H. W. Swann, M.I.E.E., Senior Electrical Inspector of Factories, has accepted the invitation of the Executive Council of the Association of Supervising Electrical Engineers to continue as president of the Association for a third year.

Mr. H. L. Howard, who was resident engineer to the Electricity Co. of Macclesfield, Ltd., when it was taken over by the Macclesfield Corporation, has been awarded compensation of £137 10s. per annum for life. The award was made by Sir Harold Morris, a referee appointed by the Ministry of Labour, who approved an agreement arrived at between the Corporation and Mr. Howard, but disallowed removal expenses claimed by Mr. Howard.

Mr. B. N. Dunster, A.M.I.E.E., has been appointed London branch manager by Siemens Electric Lamps and Supplies, Ltd., in succession to Mr. A. B. Holmes whose retirement after fifty-one years' service was mentioned in our issue of June 6th. Mr. Dunster has been in charge of the firm's general representatives throughout the London sales area for the past three years.

Mr. B. N. Dunster

Mr. A. W. James is retiring from the position of deputy traction engineer in the Sheffield Corporation Electricity Department after forty years' service. At a gathering of his colleagues on July 2nd he was presented with a radio set by Mr. A. Haddock, distribution engineer.

Mr. T. P. Easton, manager of the transport and electricity undertaking of Newcastle-on-Tyne City Council, who has retired after forty years with the authority, has been presented with a writing table by the City Council and officials.

Mr. T. S. Worthington, who for seven years was an active director of London Transformer Products, Ltd., recently rejoined the Navy as sub-lieutenant, R.N.V.R. for technical duties.

Mr. W. H. Hamilton, assistant mains engineer to the Wallasey Corporation Electricity Department retired last month after thirty-eight years' service with the undertaking.

Mr. F. Lydall, of Merz & McLellan, is one of the new members of the Council of the Institute of Transport.

Mr. E. Jones, city electrical engineer and manager, Cardiff, has been nominated for the chairmanship of the Western Centre of the Institution of Electrical Engineers for the 1941–42 session. **Mr. C. Culmer Hodges,** electrical engineer and manager, St. Austell & District Electricity Supply Co., Ltd., and **Mr. H. Coope,** district manager, Metropolitan-Vickers Electrical Co., Ltd., have been nominated as vice-chairmen.

Mr. H. N. Rodgers, station superintendent in the Rotherham Electricity Department, has retired after forty years' service.

Dr. W. Cullen has been elected president of the Society of Chemical Industry in succession to Professor J. C. Philip, F.R.S.

Obituary

Sir Keith Elphinstone.—We report with regret the death on Sunday last of Sir Keith Elphinstone, K.B.E., at the age of seventy-six. Sir Keith was educated at Charterhouse and served an electrical engineering apprenticeship. He commenced manufacturing small electrical apparatus in 1891 and two years later joined Elliott Bros. (London) as a partner, eventually becoming chairman. He was knighted in 1920.

Alderman G. H. Pattinson, O.B.E., formerly chairman of the Windermere Electricity Supply Co., Ltd., died recently at the age of eighty-five.

Mr. T. G. Griffith, a former chief electrical engineer to Buxton Lime Firms, Ltd., died a few days ago at Chester, at the age of seventy-six. He retired some years ago.

Mr. Francis Erskine Dempster, C.I.E., formerly Director-General of Indian Government Telegraphs, has died at the age of eighty-two.

Wills.—The late **Dr. H. S. Hele-Shaw,** Emeritus Professor of Engineering at Liverpool University and the first Professor of Mechanical Engineering at Bristol University, left £26,727. One half of the residue of the estate upon the death of his wife and daughter is bequeathed to the benevolent fund of the Institution of Mechanical Engineers, of which Dr. Hele-Shaw was past president.

Mr. C. C. Pudney, electrical engineer, of Colne Engaine, Essex, left £14,386.

Earth-Leakage Protection

Scheme for Groups of Portable Tools

By F. E. Butcher, A.I.E.E.
(Chief electrical engineer, Black & Decker, Ltd.)

The author, who dealt with portable tool drives in our May 30th issue, describes an inexpensive system that is proving successful in the prevention of shock on industrial premises

RELIANCE upon the flow of heavy currents for protection against earth faults brings in its train numerous ancillary problems, such as risk of fire and shock due to voltage drop along the earth conductor, owing to its rarely negligible resistance.

A leakage trip connected in the earth lead of a piece of apparatus goes some way towards disposing of the fire risk, but there is still a risk of excess voltage between the non-current-carrying metal parts of the equipment and true earth, if the trip fails to work. Also, tests have demonstrated that the *unexpected* shock obtained during the short period that the trip takes to operate in the event of a fault is sufficient to startle an operator enough to make him fall from a ladder or cause his hand to slip into a position where it might get hurt.

The protective circuit described in this article overcomes the latter very serious difficulty, and at the same time preserves all the benefits attached to the absence of heavy earth-fault currents. Primarily developed for use in connection with portable tools, it is also applicable to other industrial uses and also to the domestic field.

From the fundamental circuit shown in fig. 1 it will be seen that the earth-continuity conductor and current-carrying conductors follow ordinary present-day practice. The mid-point B of the secondary winding of a transformer, with a one-to-one or other suitable ratio, is chosen for connection to earth through the trip coil, but there is no serious objection to point A or C being used for this purpose. The use of the mid-point enables the maximum voltage to earth to be reduced from say 230 to 115 V whilst still using the 230-V cable sizes. In dangerous situations, a 110-V secondary can be used giving 55 V to earth. In some cases it is advantageous to have the switch in the mains supply (fig. 2), thereby completely isolating the transformer in the event of a fault. There is no objection to adding a further earth conductor as shown at D.

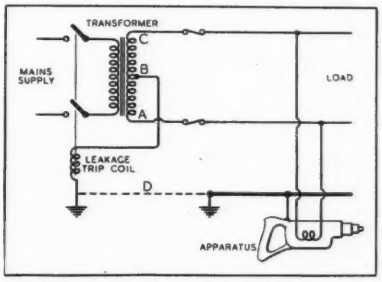


Fig. 1.—Fundamental circuit of protective system

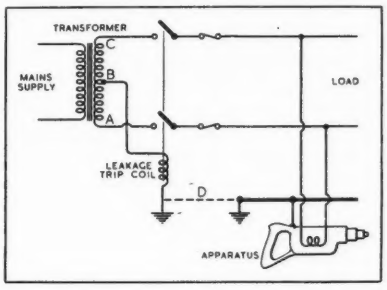


Fig. 2.—Operation of system; isolating switch on mains supply

In the event of an earth fault at E, for example, the trip will operate and isolate the circuits connected to it without a heavy-fault current flowing. Should the trip fail to work, there would be no danger of shock, as the earth conductor carries a comparatively small current. On numerous occasions I have placed one hand on a good earth and held a portable tool in the other, whilst an artificial earth has been created and maintained on the tool at the same time as the trip plunger was forcibly held back so as to prevent the trip from operating, and I have experienced no sensation of shock. The shock risk can also be visualised under similar conditions with the trip coil in the earth lead. Although the trip is unlikely to fail, I feel that in spite of the very high degree of reliability now attained with these devices, mechanical damage or deterioration is a condition that must be considered.

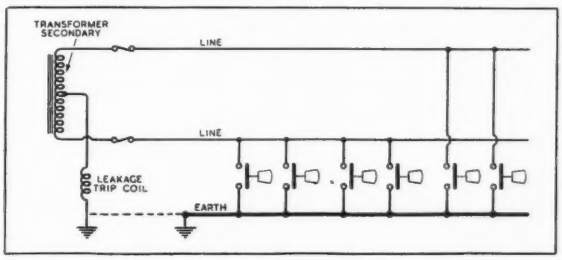


Fig. 3.—Arrangement of test buttons which can also be used as emergency stops

If, on account of prolonged operation under the test condition described above, the trip coil burnt out and became open-circuited, the earth-continuity conductor would remain unbroken, and when the circuits were next tested the trouble could be remedied. With the trip coil connected to the mid-point, this risk of burn-out is reduced to one half or one quarter, and with one trip serving a number of pieces of apparatus, testing takes place proportionately oftener.

Tests should be made at reasonably frequent intervals, and should require just the pressing of a button in an accessible place. The trip itself need not be quite so accessible, and can be in a more protected spot. The actual pressing of the button being so easy, one is apt to overlook the subsequent slight inconvenience when the trip has to be reclosed.

One of the most important features of this system is illustrated in fig. 3. With little or no additional wiring any number of test buttons can be connected, and in dangerous situations, or where otherwise desirable, these buttons can be labelled and used as emergency stop buttons, giving the same degree of usefulness as the conventional remote stop buttons but with none of the extra wiring. This feature has been embodied in the layout of the factory in which I am engaged, and the mid-point earth connection enables either line to be used for this purpose.

If the transformer breaks down due to inter-winding failure, the trip operates owing to the fault current having to pass through the trip coil, and at the same time this fault current is limited to small values. The mains voltage cannot, therefore, get through to the secondary circuit without operating the trip.

So far I have discussed single-phase working, which covers all portable universal electric tools and most household and similar cases. For a three-phase system, the trip is connected as shown in fig. 4. This has special value in the application of high-frequency portable electric tools, and trips are now available that will operate satisfactorily on 200 cycles. This safety feature is now included as standard on all frequency changers supplied by at least one tool manufacturer and the push-button stop feature can be added at small cost.

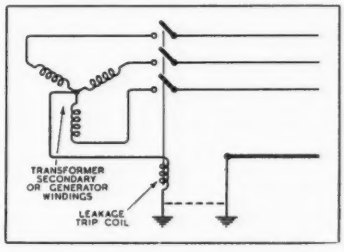


Fig. 4.—Connection of trip in three-phase system

The adaptability of this system is appreciated by the test room staff at my own factory, as in addition to its other advantages it is used to locate one of a large number of machines undergoing duration test that has developed an earth fault. All machines are switched off and the trip switch closed. The machines are then switched on in groups until the trip operates, and the process repeated with smaller groups or individual apparatus until the culprit is found.

One equipment for each group of appliances in the case of a factory seems to be the best method of using this system, which has also been applied to outdoor building jobs, and could, no doubt,

be embodied in domestic supply schemes in conjunction with automatic reclosing and individual protection.

The cost of the transformer should not prove a serious deterrent and is offset to some extent by only one trip being required for a number of appliances. The additional cost of using more transformers than one, so as to limit the area affected in a moderate sized factory by a small fault, should be quite small.

Universal tools are arranged in groups of about sixteen per transformer, and in sections of from sixty to eighty. No transformer is required with high-frequency tools as the neutral ring of the convertor is connected to earth *via* the trip coil. As a portable tool equipment has a high diversity factor the transformers can be of relatively small output.

In the domestic field, for a house costing £1,000, the pre-war prices of 9-, 5- and 3-kW transformers would be £18, £13, and £8. Smaller houses could be grouped. I do not suggest any relaxation of the earth continuity conductor regulations, although time might show this to be feasible.

Measurement of Acidity

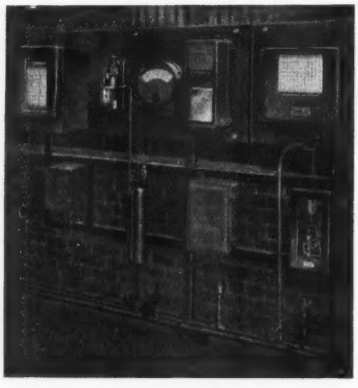
Operation of Electrical Method

EFFECTIVE acidity as shown by hydrogen-ion concentration, or pH (and not the total acidity obtained by titration) decides the reactive quality of a solution. For accurate determination of pH values, the electro-metric method possesses many advantages. This method depends upon the existence of a definite relationship between the pH value and the potential developed between a solution and an electrode.

The hydrogen electrode, used as a reference standard, consists of a platinum wire coated with platinum black round which hydrogen gas is bubbled. The electrode behaves like a plate of pure hydrogen, the platinum acting merely as a carrier of current. If the hydrogen pressure is one atmosphere and the solution is normal in hydrogen ions (*i.e.* contains one gram-ion of H per litre) the electrode is assumed by convention to be at the same potential as the solution at all temperatures. Such a system is called a "normal hydrogen electrode."

It is assumed that the tendency of hydrogen ions to deposit on the electrode, thus giving up a positive charge and making the electrode positive, is the same as the tendency of hydrogen atoms to leave the electrode as ions, taking a positive charge with them and making the electrode negative. If the concentration of hydrogen ions in the solution is greater than normal the former tendency will prevail until the electrode acquires a certain positive charge; if the concentration of hydrogen ions is less than normal the electrode will acquire a negative charge.

Completion of the electrical circuit cannot be done by simply dipping a wire in the solution, as an unknown and variable potential would be set up at the surface of contact. The second electrode must be one whose potential with respect to the solution does not vary with the pH of the solution or with the concentration of other substances present. The most usual form is a "saturated calomel electrode," which consists of mercury in contact with saturated potassium chloride solution, also saturated with calomel (mercurous chloride). Contact with the test solution is made by the potassium - chloride solution, as this does not set up a contact potential.



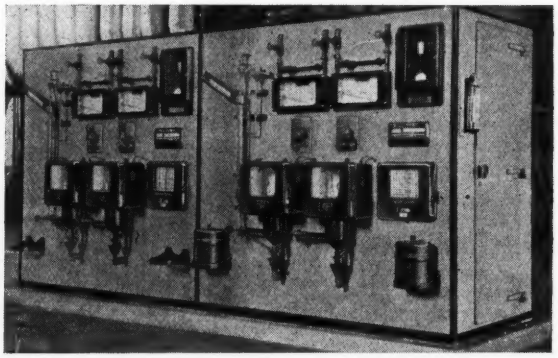
Equipment for continuously recording the pH of the boiler feed water at the Hardingstone Junction generating station, Northampton. It includes a recording potentiometer (6 to 11 pH units) and a set of continuous flow antimony electrodes. On the left of the panel is a dissolved-oxygen recording outfit

The potential E_H in volts between the hydrogen electrode and solution has the following relation to the pH of the solution at a temperature t deg. C.: $E_H = -0.0001984 (273+t) \times pH$. Roughly if t is 20 deg. C., a change of 1 pH in the solution will alter the potential by 58 millivolts. The potential E of the system, calomel electrode-solution-hydrogen electrode, is $E = E_C - E_H$, the calomel electrode being positive, so that $pH = \frac{E - E_C}{0.001984 (273 + t)}$

The potential of the saturated calomel electrode varies with temperature: $E_C = + 0.2504 + 0.0076 (t - 18)$.

The hydrogen electrode is sensitive to the presence of such substances as oxidising agents, alkaloids, proteins and ammonia. These cause a progressive drift of the potential, generally towards a positive value, known as poisoning. In the absence of poisons it gives accurate readings over the whole pH range. Other forms of electrodes, such as antimony and quinhydrone, are also used.

A radically different type of electrode that has greatly widened the scope of pH measurement in industry is the glass electrode. As the latter has a high electrical resistance the potentiometer employed incorporates a thermionic valve. The glass electrode owes its action to the setting up of a potential varying in relation to the pH difference of the solution across a thin membrane separating them. The pH/EMF relationship is practically linear up to pH 10, but the glass electrode can be used above this figure if standardised on a buffer (*i.e.*, a solution able to resist changes in hydrogen-ion concentration) the pH of which is near to that of the solution



Recording pH controllers with power units installed in connection with scrubber liquors for the flue gases at Tir John generating station, Swansea

to be measured. For general work the electrode preferably consists of a bulb of special glass filled with buffer solution, contact in which is made by a suitable constant-potential electrode.

While the relation between pH and potential is linear, the glass electrode does not give a zero potential at zero pH. The observed potential at zero pH (the asymmetry potential) is different with different electrodes and may change slowly with time in any one electrode. The bulb should, therefore, be checked occasionally against a buffer solution of known pH. The potential between the electrode and the solution is $E_G = E_A - 0.0001984 (273 + t)$ pH, where E_A is the asymmetry potential. As the measurement includes the calomel electrode, $E = E_C - E_G = E_C - E_A + 0.0001984 (273 + t)$ pH, and $pH = \frac{E - E_C + E_A}{0.0001984 (273 + t)}$

Variations of the calomel electrode potential E_C and of E_A with temperature do not affect the change of E with change of pH at any fixed temperature. Potentiometers used with glass electrodes are generally calibrated to read in pH units and no calculations are required, the instrument being standardised on a solution of known pH and automatically including both calomel-electrode asymmetry potentials. In addition to the temperature variation of the electrodes the pH of the solution itself may have a temperature coefficient.

The underlying theory of the subject, including a discussion of oxidation-reduction potentials (E_H), is further dealt with in a clear and concise manner (requiring of the reader only an elementary knowledge of chemistry and mathematics) in a publication (No. 108A) of the Cambridge Instrument Co. Particulars are included of the application of the principles in various industries with extensive bibliographies in each case. The description given of the bench and portable meters, potentiometers remote indicating and recording instruments made by the company for pH measurements are more than usually informative.

Rare Metals

Their Use in Electrical Practice

THE wide range of duties which electrical contacts are required to perform has led to the manufacture of an extensive range of special materials. These are for the most part the rare metals platinum, palladium and gold, either alone or alloyed with iridium, ruthenium, rhodium or silver.

Many contacts involve a compromise in qualities. It may, for example, be necessary to have a high melting point to withstand arcing effects combined with a softness suitable for working under light pressure, or the metal may be required to resist erosion, to be a good conductor of both electricity and heat, or to keep its shape and wear uniformly under the hammering effects of heavy spring make and break contacts. In the breaking of a current Butteridge and Laird found that there is almost universally a stage intermediate between the resistance rise and the arc when the gap is bridged by a drop of molten metal, the p.d. being then only of the order of 2 V.

A platinum-iridium-osmium alloy made by Johnson, Matthey and Co., Ltd., heads the list of contact metals for melting point at 2,000 deg. C. A somewhat similar alloy made with ruthenium by the Baker Platinum Co. has a melting point of 1,890 deg. C., with a Brinell hardness of 315. Platinum alone has a melting point of 1,773 deg. C., and a Brinell hardness of only 47. While platinum has a melting point which ensures arc resistance, and is completely immune from corrosion, it is too soft to serve for contacts except those working under light pressure; it does, however, fulfil the requirements for contacts in telephone relays and in light contact mechanism when there must be no change in resistance due to the formation of oxides or insulating compounds on the contact surfaces.

Hardening Platinum

Iridium, ruthenium and osmium, alloyed with platinum, harden it considerably. As instances of the selective effects of alloying one may compare 20 per cent. iridium-platinum and 10 per cent. rhodium-platinum. Both alloys have the same melting point within a few degrees, but whereas the iridium alloy has a hardness of 230, that of the rhodium alloy is only 90. For relay contacts, electric clocks and thermostats gold-silver alloys hold the field, while in telephone construction an alloy of gold, platinum and silver (gold predominating) is the most popular.

Tarnishing, which is due to the formation of complex oxides or sulphides, is completely non-existent only in the case of platinum. A much used tarnish-resisting alloy is that of platinum, gold and silver in the proportion of 7 : 67 : 26. In many cases tarnishing may be absent until a critical temperature has been reached; thus iridium will only oxidise if subjected to 900 deg. C. or over; palladium fails above 350 deg. C. All alloys containing silver are liable to tarnish owing to the strong affinity which silver has for sulphur; they should never be used near rubber-covered wire or ebonite.

The principle causes of failure of electrical contacts have been discussed recently by Dr. J. C. Chaston in a paper shortly to be published in the Meter and Instruments Section of the I.E.E. *Journal.*

Where there is a low voltage and light contact pressure *pure* silver has been found quite satisfactory. As a thin facing on copper it has been applied to large contact gear carrying heavy currents on a wide scale. Cheaper and harder than pure silver are the silver-copper alloys applicable to contacts which in making exert a wiping action that is to some extent self-cleaning. A palladium-copper alloy, " No. 60 ", has been developed by Johnson and Matthey for light-duty contacts in telegraph relays as it resists well the carrying-over tendency of metal from one contact surface to the other.

Bi-metal, which in one instance takes the form of copper sheet faced with silver, is manufactured by this company for making up into contacts for power currents which are so built up that the effective surface consists only of silver. The fine silver used is stated to be immune from oxidation and has a high electrical and thermal conductivity. Brass, nickel and phosphor bronze are similarly faced with platinum or alloys of precious metals.

Employment in Pyrometry

The precious metals figure largely in thermo-elements as used in pyrometry. A platinum and platinum-rhodium thermo-couple has long been used by the U.S. Bureau of Standards in its standard potentiometer pyrometer. While thermo-couples of iron and constantan are satisfactory for temperatures up to 800 deg. C., and chromel and alumel up to about 1,200 deg. C., the precious metals give the greatest accuracy and show the greatest stability. They can be used up to between 1,500 and 1,600 deg. C. The elements generally employed are 90-platinum and 10-rhodium for the positive, and C.P. platinum for the negative. Taking the cold junction at 0 deg. C., the e.m.f. of such a thermo-couple would be 0.66 millivolt at 100 deg. C., 6.77 at 750 deg. C., and 15.63 at 1,500 deg. C. Corrections can be made for the " cold " junction; thus for each degree that it is above zero to 400 deg. C. 0.7 deg. C. would be added to the reading, or 0.6 deg. C. in the range from 400 to 1,000 deg. C., and so on. Thermo-couple wires are made containing both 10 and 13 per cent. of rhodium; care is taken that the virgin metals are completely free from other elements of the platinum group. Freedom from traces of iron is also of importance.

Another use for platinum or platinum-rhodium alloy is for the resistance windings of electric furnaces designed for operation at between 1,000 and 1,400 deg. C. Even moderately large furnaces can be wound with tape of these rare metals. Apart from having a high satisfactory average life, the return value of the used metal is quite substantial.

Platinum and palladium can both, by the way, be prepared in the form of foil as thin as one ten-thousandth of an inch. The Baker Platinum Co. supplies wires in some rare metals drawn by the Taylor process to 0.00004 in. diameter. It is difficult with the most refractory metals to produce lengths longer than 12 in. Although nickel is not a " precious " metal, it may be of interest to note that nickel strip has been used on a considerable scale in the making of radio valves in place of woven wire gauze, in view of its greater rigidity and even distribution of current.

Apparatus for Tropical Conditions

New German Testing Rules

A CORRESPONDENT writes:—The interesting views expressed by Mr. L. A. Williams in his article " Electrical Engineering Exports," published in the ELECTRICAL REVIEW of June 6th, can be confirmed by the experience of Continental electrical firms. Regarding the advantages of designing apparatus not intended for tropical use with " tropical finish," a practical example may be mentioned.

Two Continental manufacturers were developing a similar type of high-voltage gear. One firm, " export minded," employed porcelain throughout its apparatus; the other made certain parts of bakelised paper unsuitable for tropical climates. When the question of export arose, this manufacturer had to design, develop and test the gear from the start, which entailed long delay, expense and a higher selling price.

Meanwhile, the first-named manufacturer had, and exploited to the full, the opportunity to conquer the markets abroad and to book substantial orders for his original home-designed gear, thus being more than compensated for the little extra cost of his apparatus for the home market.

An important reason for the success of the German electrical industry in the export market was its readiness to meet any foreign specification or standards at a customer's request, especially in such cases where these standards were less stringent than the German V.D.E. Rules. Furthermore, much stress was laid on the " tropical finish " of material and construction. Some years ago the leading firms had especially built " tropical testing rooms " where complete apparatus, as well as parts, raw materials, lacquers and coatings were tested for their resistivity, effects on dimensions, etc., under tropical conditions.

Even now during the war, the German electrical industry appears to be actively conscious of the importance of this question. In November last year a committee of the Association of German Electrical Engineers (V.D.E.) published a report containing rules to be adopted for such tests under tropical conditions. These rules may be of general interest, in view of their rather unconventional nature. It is not the intention that each apparatus which will be used later in a tropical climate, shall be tested under such conditions in the factory, but that the typical design and the materials used shall be subjected to such tests.

The rules provide a test run of short duration showing the tendency to the formation of detrimental influences and a continuous test run, results of which permit conclusions to be drawn concerning the life of the equipment under tropical conditions. The specified conditions are based on thorough climatic investigations, using statistical data of various parts of the tropics. It may be of interest that special consideration has been given to the

climatic conditions in the former German African Colonies as well as in various parts of the Sahara Desert. The conditions specified in the rules cover, therefore, the damp and hot climate of the tropical virgin forest, or alternatively the dry heat and the sand storms of the desert. The following tests are specified:—

Damp heat.—Test in a chamber with walls impermeable against humidity in an atmosphere of 40 deg. C. and 90 per cent. saturation. Duration of short test run, four weeks; of continuous test run, three months.

Damp heat and dew.—Test alternating in a damp room as above, and in a room with an atmosphere of a saturation not exceeding 75 per cent. at a temperature of 20 deg. C. The test may be made in the same room with a corresponding variation of the temperature and saturation. The cycle of heating and cooling has to be repeated 50 times for the short test, and 200 for the continuous test.

Heavy change of temperature combined with dew and frost.—The temperature of the test piece is brought to 0 deg. C. in a cooling chamber and is heated afterwards in the damp-heat chamber mentioned above to 40 deg. C. causing the formation of dew. After evaporation of the dew, the test piece has to be cooled down again to 0 deg. C. This cycle has to be repeated for the short trial run 50 times and for the continuous trial run 200 times.

Dry heat and sun radiation.—The sun radiation is reproduced by an electric heater and a high-pressure mercury-vapour quartz lamp. The temperature during the test is brought up to 55 deg. C., but the spot where the test piece is afterwards put must show a temperature of 80 deg. C. measured with the black bulb thermometer. Within 24 hours the test piece has to be exposed to the radiation for 8 hours. This cycle has to be repeated for 6 days for the short trial run, and for one month for the continuous test run.

Effect of grit-laden wind.—A mixture of emery and quartz sand having a specified size of grain, is blown in a wind tunnel on the test piece, with an air velocity of 15 to 20 m/sec., at a temperature of 55 deg. C. Duration of short test run, 8 hours; of the continuous test run, 6 days.

Formation of mildew.—The test piece is placed in an airtight glass vessel. The formation of mildew is enhanced by inserting a mixture of malt and agar producing the required fungi. The duration of the short test amounts to 4 weeks; of the continuous test 4 months.

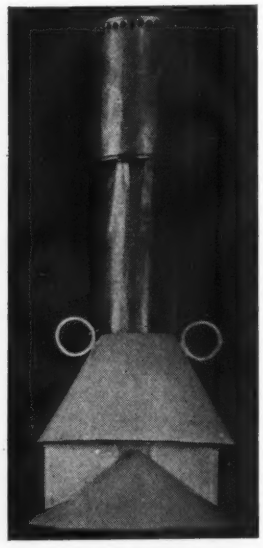
Effect of salt deposits.—The test piece is put into a spraying chamber, in which for each cubic metre of volume and per hour, 30 c.c. of 3 per cent. sodium-chloride solution are sprayed on to the test piece. Duration of the short test, 3 days; of the continuous test, 4 weeks.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions.

Road Obstruction Lighting

ROAD openings tend to be more frequent in wartime and it is important to see that they are properly marked at night. Hurricane lamps are often difficult to get and are unsuitable unless very thoroughly masked. These lamps consume paraffin at the rate of about 20 c.c. per hour, and it is not possible to turn them down low. This consumption is greatly in excess of what is required.



The road obstruction lighting fitting described by the writer

After a great deal of trial and experiment the lamp illustrated was produced in an attempt to provide something more in line with the actual requirements. It consumes paraffin at the rate of about 2 c.c. per hour and will remain alight for three days and nights without attention. The construction is simple, requiring only sheet metal and solder; metal from old tins is suitable, in fact the upper part of the lamp is made from a complete tin can. There are no special screw caps or wick-regulating devices requiring special punching.

The light from the wick escapes vertically downwards through a small glass window, ½ in. in diameter, and illuminates the lower white cone in a very effective manner. A drop of red "Shadolite" varnish on the upper surface of the window gives the desired colour. Lighting engineers will be reminded of the "starlight" fittings. In this case the maximum brightness is in a direction parallel with the road, and the upward brightness has been reduced to a minimum. Some light must be allowed to escape upwards because otherwise the lamp on the ground would be invisible to road users.

I shall be glad to furnish full constructional details to anyone wishing to make the lamp if he will write to me at "Bintang," Parkland Avenue, Upminster, Essex. I propose to make this an opportunity of aiding the Red Cross Fund. It is necessary to say that the patent covering the burner belongs to Mr. A. W. Richardson, of the Shell Mex Co.

Stepney, E.

D. G. SANDEMAN,
Public Lighting Superintendent.

Chief Engineers' Salaries

TWENTY years ago an attempt was made to agree on salaries and conditions for chief electrical engineers by a Committee representing, on the employers' side, every class of municipal undertaking, and on that of the engineers, elected representatives from their Association. A schedule was eventually agreed and recommended for adoption by municipal undertakings, and a definite promise was also made by the employers and recorded in the minutes that a Standing Joint Committee would be set up to which all questions arising between the two parties could be referred for settlement. The schedule was not adopted by more than about half the undertakings, and the Standing Joint Committee was never established. The chief engineers had just grounds of complaint, but have been very patient. Their organisation is a registered trade union and represents almost 90 per cent. of the possible membership.

A few years ago another approach was made to the employers, and as a result of resolutions passed by meetings of municipal representatives in each of the districts, representatives were appointed to form a National Committee to examine the whole position and then to meet the chief engineers.

The objectors to the Walker Scale had urged that there ought to be a difference between the salaries of engineers operating their own generating stations and those without a station. Also that bulk supplies should in some way, be de-valued, and the same regarding supplies to large consumers. These were the only serious objections ever raised, and the object of the employers' representatives on the new Committee was to devise a method by which all the above points would be met. After much careful consideration of many suggestions certain formulæ were worked out which produced satisfactory results. Discussions with the chief engineers commenced and eventually unanimous agreement was reached at a meeting of the two sides at York, and these findings have now to be submitted to the Districts for approval or otherwise.

The basis is "units sold" (not generated), and units are de-valued in accordance with a simple schedule contained in the agreement. For instance: The units sold by an undertaking generating all its own requirements will represent 100 per cent.; the units sold by an undertaking purchasing the whole of its requirements will be 75 per cent.; if partly by each method then *pro rata*; units sold as bulk supplies are de-valued to 30 per cent.; and units sold to large consumers are de-valued according to a scale which is easy of application to 30 per cent.

It will be seen that the employers have taken care of all the points urged upon them, and they have succeeded in getting very material recognition of their policy of de-valuation. As chairman I wish to say how much the chief engineers have helped by agreeing to what are undoubtedly very material reductions in the existing scale, and by taking a statesmanlike attitude right through the negotiations.

Now, Sir, what are the alternatives? Because there are alternatives. The position is not by any means what the diehards amongst the employers seem to think it is. They assume that if they vote against and destroy the agreement, things will go on as before and that they will be able to pay just any salary they like, but this is not so.

The chief engineers' Association represents practically all those eligible for membership. It can affiliate with other trade union organisations, and should the proposed agreement be destroyed the chief engineers will, I hear, consider the advisability of joining the E.P.E.A. thus gaining direct contact with the employers through the District and National Joint Boards. There is nothing to prevent their doing this, and they only abstained from doing so previously because of the employers' arguments against the desirability of the chief engineer belonging to the same trade union and sitting on the same side of the Board as members of his staff for the purpose of dealing with questions of remuneration and discipline.

The engineers have kept to this understanding, but the employers have failed to honour their promise to set up machinery by which matters of joint interest could be considered. I submit, therefore, that the chief engineers could not be blamed if they decided to

strengthen their position and to gain the right of contact between their official organisation and the employers. I have no doubt what I should do personally.

Manchester. W. WALKER.

Empty Cable Drums

MIGHT I suggest to the Director of the C.M.A. that he is barking up the wrong tree in his letter published in the ELECTRICAL REVIEW of June 27th, as it is not the purchasers of cable, but the members of his own Association who are at fault. I simply *cannot* get suppliers to remove their empty drums, or the railway companies to collect them. They are in the way, and causing congestion in our yards. All efforts to get them removed have been of no avail.

If the Assistant Controller of Timber had ascertained the facts from the men on the job, he would not have written such a stupid letter to the C.M.A.

F. W. PURSE,
Chief Engineer,
London, W.C.2. London & Home Counties, J.E.A.

Electro-formed Reflectors

IN your issue of April 11th you refer to electro-formed reflectors. It may interest your readers to know that this process was introduced by the late Sherard Cowper-Coles many years ago, and was fully reported in your issue of September 29th, 1899.

Mr. Cowper-Coles continued to work the process and make improvements from time to time and his work was followed by the Admiralty, who carried out tests on reflectors made by the process. In 1935, at the request of the Admiralty, licences to make searchlights by the process were granted to two leading manufacturers. The reflectors are finished with a flash of rhodium plating.

Sunbury-on-Thames. C. H. COWPER-COLES.

The Association of Scientific Workers

THE views expressed by "Professional Engineer," in your issue of June 20th, are certainly "old fashioned," as "Another Engineer" points out in the issue of June 27th, but I feel that neither is truly indicative of the attitude of the majority of your readers to the A.S.W. and the policy which it advocates.

Numerous examples exist of improved results in research and development, where the policy of close collaboration between well-paid qualified engineers has replaced the more primitive method of playing off one section (or individual) against another on the basis of pronounced wage inequality, a fact which will have to be borne in mind as the field of industrial development increases.

The object of the A.S.W. is to raise the standard of living of professional engineers in keeping with their status and has a parallel in the Employers' Federation. It cannot be denied that many qualified and competent engineers are paid wages which are a disgrace to the profession.

Birmingham, 29. NORMAN W. BERTENSHAW, B.Sc.

IN their letters appearing in your issues of June 20th and June 27th both "Professional Engineer" and "Another Engineer" attack the Association of Scientific Workers mainly on the grounds that organisations formed to improve the material conditions of their members destroy individuality.

Such a view is thoroughly unscientific for it is obvious that since in general the opportunities for individual expression on the part of any employee vary directly with the salary level, the aim of raising the present admittedly low status of scientists and engineers must of necessity be an attempt also to gain for the majority of technicians a greater recognition of their individuality.

Moreover, the A.S.W. is a body of intelligent, thinking individuals agreeing freely to co-operate in certain matters for their common good, not a body of robots submissively accepting arbitrary standards of working conditions dictated by a minority, and I would suggest that your correspondents examine their opinions again in the cold light of reason which will undoubtedly expose them as the outworn beliefs of a rapidly disappearing age.

Manchester. J. F. AMOR.

NO wonder "Professional Engineer," of Chester, did not have the courage to give his name. Fascism within and without is the enemy of trade unionism.

Doctors, lawyers, cinema stars, all have their unions. Workers outside a union should note that they may be enjoying conditions as a result of trade union action. In a world of big business we cannot stand alone.

P. LEE,
Southend. *Branch Secretary, E.T.U.*

Multi-Motor "Black-out" Installation

A CAMOUFLAGE installation recently completed at a large factory provides for "blacking out" 550,000 sq. ft. of roof lights in 15 seconds by pressing a button and doing the reverse process in the same way and in the same time.

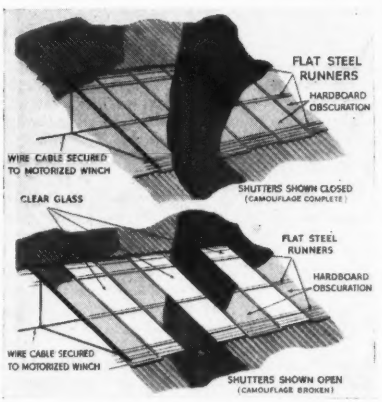
Originally hard wallboards were fitted to the outside of all the north lights and other windows. The resident engineer to the contractors for the "black-out" installation, Mr. L. A. Sharland, of C. F. Anderson & Son, Ltd., undertook the task of preparing a scheme and installing the necessary equipment for modifying the obscuration. Alternative panels were removed from the north light windows and they were fixed into a frame in their respective positions over the windows, the frame being made to move laterally across the whole span of lights through grooves cut in tee sections fixed to the glazing bars. Steel cables were fixed to each end of the frame, passed over spring tensioned pulleys and secured to a winch mounted on the wall inside the factory.

The winch is operated by a ¼-HP DC compound-wound G.E.C. "Witton" motor. The forward and reverse movements of the shutters are obtained by reversing the direction of the motor, which is controlled by forward and reverse contactors operated by two limit switches. The latter are tripped by fingers mounted on steel rods secured to the cables which travel up and down through a distance equivalent to the movement of the steel frame. Each span of lights of approximately 1,000 sq. ft. is operated by one ¼-HP motor and over 500 motors have been installed.

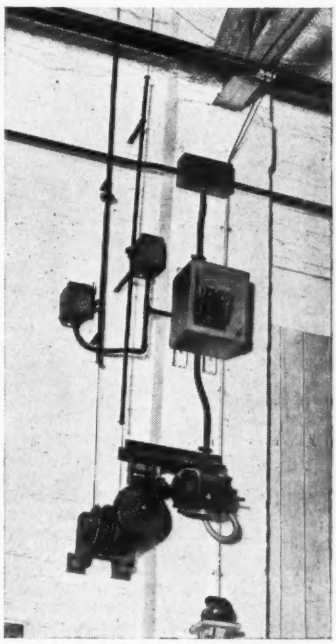
So that the motors can operate quite independently of the main electricity supply to the factory storage batteries have been arranged in twelve groups in convenient places throughout the factory. Each group consists of twenty 12-V batteries, trickle charged, and are connected to master contactor panels operated from a time switch with a time lag of 25 seconds. Each group of batteries is provided with a push-button so that each master contactor can operate its individual section of shuttering if required. Each bank of batteries is, in turn, connected by means of underground armoured cable to a panel in the A.R.P. control room, and the whole factory is thus controlled from the one central position.

In the event of damage to the electrical equipment, the motors can be disconnected and the winches operated by hand in each individual bay.

In addition to the motors and extensive switchgear the General Electric Co., Ltd., also supplied some 230,000 yd. of cable, 150,000 ft. of steel conduit and 450 sets of contactors, as well as the specially-designed starter panels and relays, etc. The admission of daylight effected by this scheme has had markedly beneficial effects.



Method of fixing movable shutter over north light



Winch driven by ¼-HP motor with limit switches

Practical Aid from Americans

The Civilian Technical Corps

REFERENCES have recently been made to the formation of a Civilian Technical Corps by means of which it is hoped to secure technically trained men in the United States for helping to maintain the highly-specialised equipment used by the Empire fighting forces. We have now received a copy of a booklet issued by the British Consulate-General in New York with the approval of the United States Government, setting forth full details of the scheme.

The Corps is non-military in character and is a body of paid volunteer craftsmen in certain skilled trades. Members work in close co-operation with and for the armed forces but are free from combatant duty and military discipline. They are, however, subject to the regulations of the Corps and to the laws governing civil defence workers in the British Commonwealth of Nations.

Any male citizen of the United States is eligible for membership provided he is between the age of 18 and the maximum limit set for the technical category which he wishes to join; is physically fit and of good character; and is technically qualified to pass the examinations required for his particular category.

Volunteers must agree to serve for three years or for the duration of the war, whichever period is the shorter and they will be required to serve in the United Kingdom or elsewhere overseas. Free board and living quarters and distinctive clothing will be provided free by the British Government. Rates of pay and allowances are specified as are such matters as hours of work, holidays, medical attention and general welfare.

A volunteer does not forfeit his American citizenship since he does not take an oath of allegiance to the King, and he will be immediately released if the United States should require his services.

Broadly speaking, thoroughly experienced men in any of the following general classifications are eligible for membership:—Radio mechanics and engineers; fitters of all kinds; electrical technicians; instrument makers and repairers; watch makers and meter mechanics; metal workers; machine tool setters and operators; wiremen and ships' electricians; sound engineers; automobile mechanics; and ordnance and engine-room artificers.

The age limits for electricians are 18 to 50 years; their duties include the maintenance and repair of all electrical gear (other than radio and heavy permanent electrical plant) and the electrical equipment of aircraft; the installation, adjustment and calibration of all heating, lighting equipment, etc., fitted in aircraft; the dismantling, repair, assembly, testing, inspection, maintenance and wiring-up of electrical instruments and apparatus; the installation, maintenance and repair of electrical equipment and ignition systems in transport; the floodlighting of hangars and aerodromes; and the overhaul, repair and testing of magnetos.

Applicants are expected to have at least three or four years' experience in the trade and should have some theoretical knowledge. Their practical knowledge must include the care of accumulators, hard and soft soldering and cable jointing.

Marine electrical artificers are required to maintain and repair dynamos, motors, power supplies, switch and control gear, fire control apparatus, gyro-compasses, searchlights and ships' electrical apparatus. They will be trained in the maintenance of torpedo equipment, etc. Applicants must be skilled fitters but it it stated that they need not possess electrical knowledge as this can be acquired after enrolment.

Marine wiremen are wanted for the care and maintenance of the various electrical circuits found aboard ship and of the simpler electrical machinery. They need a knowledge of simple wiring, re-wiring and general maintenance of lighting and power circuits and ability to joint cables and trace faults.

Radio mechanics are put into two classes:—For special duties and for communications services. The duties of the first class comprise the overhauling, inspection and maintenance of complex high-frequency apparatus, including aerials and mechanical gear, employed at special radio stations, and of radio apparatus used in aircraft; and the operation and maintenance of i.c. engine generating plants. Men for communications services are required to test, install, maintain and repair ground and aircraft radio apparatus.

Grouping of Contractors

Views Expressed at Birmingham

AT a special meeting in April (reported in the *Electrical Contractor and Retailer* for July) the Birmingham Branch of the Electrical Contractors' Association discussed the recent E.C.A. memorandum on the effect of the war upon members' businesses. This, it will be recalled, suggested that members in a locality should form a company to take over and combine the businesses of the individual units for the duration of the war.

At the outset the chairman (Mr. H. F. Truman) asked the secretary (Mr. R. T. Janney) to give his views on the financial aspect. Mr. Janney said that if amalgamation schemes were effected, a saving might be made by a standardised memorandum and articles of association drawn up by the Association's solicitors. Provision would have to be made for the winding up and distribution of assets, and he suggested that assets might be distributed in specie as, for instance, some members might have certain plant and gear which they would lend or hire to the parent company, but which they would like to retain for themselves after the war. It might be better to use an existing company and only change the actual shareholders, showing on notepaper, etc., the names of the other firms which were incorporated.

He realised there might be some difficulty in arriving at a satisfactory basis for agreeing a figure for goodwill, as the past business and immediate present condition of business might vary considerably, but he felt sure some method could be mutually arranged. He thought it would be necessary for each contractor to pay his own creditors and collect his own debts to the date of amalgamation and the work in progress would have to be valued.

A member asked if such a scheme was necessary in Birmingham, where members were exceedingly busy, and the main trouble was the shortage of labour. Mr. Reynolds said that while members in the City were very busy, there were some on the outskirts and in the suburbs whose business had suffered considerably.

Other members asked if it was certain that economies could be made by amalgamation. It was pointed out that the supervising staff and estimating staff of any one firm might be slightly extended to cater for twice the amount of turnover and thereby release some of the staff used by the two firms for Government positions or the armed forces. Another point raised was that retail trade in the near future would become very difficult, and those members who had large showrooms would not be able to use them as in the past.

The chairman stressed the point that such a scheme which was visualised in the memorandum was not compulsory, and it was left to each member to follow his own course. It was considered that the Government would require the contracting industry to consolidate itself considerably, and members would appreciate that a Government scheme was not likely to be so acceptable as a voluntary scheme effected now.

Several members asked what the Government could do to close up the small businesses. The reply was that the Ministry of Labour and National Service could transfer the men to more important work, and a contractor could hardly work without wiremen.

It was impressed upon the meeting that the Director was only anxious to safeguard members' interests and to try to preserve the members' businesses, so that they could operate after the war. In some cases members had been compelled to draw upon their capital, and this could not go on for very long. The Association, in putting the possibilities before the membership, was only doing its duty and giving each member an early opportunity to help himself where conditions warranted some consolidation.

The opinion was expressed that there was an increasing tendency to cut out the small business, and, therefore, it was important to examine the amalgamation scheme very carefully, as, possibly, such amalgamation of firms might continue after the war. Another member said that he considered that the small contractor was being forced out of business, and a discussion took place upon the overheads necessary in various sizes of business. The question was also asked: Was there a real possibility of a compulsory Government scheme? The chairman pointed out that Head Office was hardly likely to issue such a memorandum unless the possibility was a very real one. It was the opinion of the Council, however, that any scheme would be arranged through the Association.

It was resolved that any member who wished to sell his business should communicate with the branch secretary, who could advise him as to the best course to take; and that technical advisers, members of the branch, should be appointed to advise from that angle where necessary.

At the annual meeting of the Bradford Branch on May 29th, the opinion was expressed that "the scheme was impracticable in the district" and no action was taken.

COMMERCIAL and INDUSTRIAL NEWS

Building Control and Contractors. Home Guard in Industry.

Production of Replacement Parts

MANUFACTURERS and traders who have the necessary plant and labour for turning out replacement parts in small numbers may be interested to know that there are now ample opportunities for making use of their facilities. They can select the work from a very wide range of products used by the Army, including gun parts and mountings, wireless parts and electrical equipment such as mouldings.

It should be emphasised that it is not a case of repetition work. Rather is it work which involves high-class workmanship; in most cases " a tool-room job " is wanted. Nor is it a case of finishing a semi-manufactured part; the product has to be turned out from the raw material and it may involve casting and machining.

Where a manufacturer or trader has the necessary facilities and labour but cannot obtain raw material, it will be provided. Complete drawings and specifications are available and contracts can be arranged without the delay usually involved in going through many Government Departments. Furthermore, such contracts may be produced as evidence that the firm is on work of national importance and would be useful for retaining labour if it is not yet " protected."

Manufacturers and traders who are interested should get in touch without delay with the Central Purchase Office, Long Drive, Greenford, Middlesex; 54, Bradford Street, Birmingham; Imperial Buildings, 1–5, Oxford Road, Manchester; or 45, Union Street, Glasgow, C.1, according to where their premises are situated.

Control of Building Operations

The Director of the Electrical Contractors' Association (Mr. L. C. Penwill) has drawn his members' attention to the effects of S.R. & O. Nos. 1678 of 1940 and 437 of 1941, relating to the control of building and constructional operations. He points out that these require the obtaining of a licence to carry out work on new buildings or alterations to existing buildings if the estimated cost exceeds £100. Electrical contractors may act as agents for the building owners in the obtaining of such licences.

The building owner is liable to a penalty if he fails to obtain a licence and a duty falls also on the electrical contractor to see that a licence has been obtained before he starts work. The appropriate forms can be obtained from the Regional Licensing Officer of the Ministry of Works and Buildings in the region in which the contractor's premises are situated, but they must be returned to the Regional Officer of the district in which the work is to be carried out. These forms are as follows :—O.W.L. 1136.—Application for licence to cover work exceeding £100 in value; O.W.L. 1140.—Application for certificates to purchase controlled materials when a licence has been granted; O.W.L. 1142.—Application for certificates to purchase controlled materials for new work where the estimated cost is less than £100; and O.W.L. 1143.—Application for certificates to purchase controlled materials to carry out works of maintenance and repair.

Factory Home Guard Liaison Officers

The Electricity Commissioners have been notified by the War Office that Liaison Officers have been appointed on Command Headquarters to deal locally as far as possible with Home Guard and factory defence matters in the case of factories and undertakings for which the various Government Departments are responsible. Any Home Guard problems and suggestions which electricity undertakers have hitherto usually referred to the Commissioners should, in the first instance at least, be referred in future to the Factory Liaison Officer in their locality, who will subject to Command Headquarters views dealing with such problems and suggestions. The list of Commands and Liaison Officers is as follows:—

Eastern Command.—Lieut.-Col. A. R. Thompson, M.C., Watergate House, Adelphi, W.C.2. (Tel.: Gerrard 6933, Extn. 794.)

South Eastern Command.—Lieut.-Col. T. Donnelly, D.S.O., Watergate House, Adelphi. W.C.2. (Tel.: Gerrard 6933, Extn. 749.)

Western Command.—Capt. The Lord Carnegie, K.C.V.O. Staffs., Salop, Warwick, Worcester, Hereford: Lieut.-Col. W. de L. Passy, 20, Norfolk Road, Edgbaston, Birmingham. (Tel.: Edgbaston 2981); Cumberland, Westmorland, Lancashire, Cheshire: Lieut.-Col. J. C. Brewer, M.C., and Lieut.-Col. C. B. Mosse, Britannia House, Fountain St., Manchester,2. (Tel.: Deansgate 4343, Extn. 69); Wales: Lieut.-Col. A. I. G. McConkey, Halidon House, Abergavenny, S. Wales. (Tel.: Abergavenny 349.)

Scottish Command.—Lieut.-Col. W. L. Stewart-Meiklejohn, 1, Glassford Street, Glasgow, C.2. (Tel.: Bell 3586.)

Northern Command.—Northumberland, Durham, North Riding of Yorkshire: Major F. E. Davies, M.C., Clarendon Buildings, West Clayton Street, Newcastle-on-Tyne. (Tel.: Newcastle 27623); East Riding and West Riding of Yorkshire: Lieut.-Col. V. Cambier, Queen's Buildings, Queen Street, Sheffield,1. (Tel.: Sheffield 22884 and 20720); Derby, Lincoln, Notts, Leicester, Northampton, Rutland: Major M. J. T. Reilly, M.C., 2, Carrington Street, Nottingham. (Tel.: Nottingham 45721.)

Southern Command.—Lieut.-Col. P. D. Green-Armytage, Royal London House, Queen Charlotte Street, Bristol. (Tel.: Bristol 23718.)

Industrial Court Award

Among the awards of the Industrial Court reported in the June *Ministry of Labour Gazette* is one concerning electrical craftsmen in the Lincolnshire heavy iron and steel trade. The Electrical Trades Union claimed an increase of 2s. a week for these men, but the Court decided that there should be no increase in the existing rate.

Lamps for Eire

The removal of the embargo upon the importation of low-voltage lamps into Eire, announced in our last issue, opens up opportunities for British manufacturers. A firm of electrical distributors in Cork has asked to be put into touch with British makers of automobile and low-voltage house-lighting lamps, and we shall be glad to pass on the names of any interested manufacturers.

Rectifier-Transformer Production

In an endeavour to shorten the time required for the manufacture of complete rectifiers, the Nevelin Electric Co., Ltd., at the beginning of this year commenced the production of the auxiliary transformers required for the ignition and excitation circuits. For this purpose a small extension was added to the factory and the necessary equipment was made to the designs of the chief engineer. Although " starting from scratch " with no skilled operatives, the new venture has proved so successful that the company is not only producing all the auxiliary transformers required for its own purposes, but is also supplying a considerable number of air-cooled low-voltage units up to and including outputs of 10 kVA to other manufacturers for various purposes.

Assembling an air-cooled low-voltage transformer at the Nevelin Electric Co.'s works and a batch of units awaiting despatch

English Electric Savings "Target"

Savings groups in factories, works and industrial organisations in all parts of the country are laying their plans to play their part in the National Savings Committee's summer drive to find the extra £6,000,000 per week which the Chancellor of the Exchequer requires from private savings. The Committee has suggested that each group should set itself the task of raising in one, four, eight or twelve weeks enough money to pay for a war weapon. These " targets " range from an £8,000,000 battleship to a penny split pin and include weapons suitable in price for the purse of every kind and size of group.

The savings groups of the English Electric Co., Ltd., have already decided on their " target." During the month of June they are to raise £55,000 to buy a motor torpedo boat. A special publicity and propaganda drive to increase the number of members and the amount of subscriptions has been organised by the company.

Fatalities

A man was killed and two others received severe shock at the works of Newton Chambers & Co., Ltd., Chapeltown, recently, when they were testing an excavator in a field. Apparently, the jib of the machine, which had a projection of 30 ft., came into contact with a power line belonging to the Yorkshire Electric Power Co.

The Sheffield Coroner held an inquest on June 26th into the death of John H. Smethurst, following an explosion at a substation of the Yorkshire Power Co. Evidence showed that the deceased man was moving a ladder with steel supports in the substation when it made contact with a 66-kV bus-bar. The clothing of Smethurst and another man who was with him was burned.

A witness said that there were printed instructions that no ladders should be moved in a substation without permission. The Coroner recorded a verdict of death

due to shock and burns accidentally caused.

In an action brought at Notts Assizes recently by Francis West, Ilkeston, against the Cossall Colliery Company for damages in respect of his son Francis, aged 18, a settlement was announced. It was stated that the company would pay £300, plus £25 funeral expenses. West was a loader at a colliery and was killed when he touched a switch. Counsel remarked that although the figure might appear small he had advised acceptance on the ground that there might have been contributory negligence on the part of the deceased. Mr. Justice Oliver approved the settlement.

A verdict of "Accidental death" was recorded at an inquest on June 30th into the death of Pte. J. Binnes, of Stretford. It was stated in evidence that Binnes, a qualified electrician, was tracing a fault in the wiring of an Army hut and instead of taking out the switch drew a fuse which proved to be the wrong one. He received a shock and although artificial respiration was applied he failed to recover.

Rapid Restoration of Lamp Service

It is now possible to reveal, Crompton, Parkinson, Ltd., tell us, that in a recent air raid their Crompton and Kye Lamp Depot at Brixton was almost completely destroyed. Only the outer walls were left standing, but the large neon sign and clock, familiar to most South Londoners, remained almost intact, although the clock itself stopped at the time of the "incident."

The Brixton staff, following the previous good examples of their Liverpool and Manchester colleagues, strove to resume normal operations in record time, and within a few hours they were installed at Electra House, Victoria Embankment, W.C.2, the London headquarters of Crompton Parkinson, Ltd., and orders were being executed and inquiries dealt with as if no interference had occurred. After a further short interval a complete replacement stock of lamps and v.i.r. cable had been assembled and a new trade counter opened at Ferguson House, 124, City Road, E.C.1 (telephone Clerkenwell 3234/5/6), and here the new Crompton and Kye Lamp Depot is functioning with the usual efficiency.

Merchandise Marks in South Africa

The *Chamber of Commerce Journal* draws attention to section 9 of the Merchandise Marks Act, 1941, which will come into operation in the Union of South Africa on October 18th. This reads as follows:—"Any person who sells or, for the purpose of advertising goods, distributes in the Union any goods which were not made or produced in the Union, and to which there is applied any trade mark, mark or trade description in the English or Afrikaans language, shall be guilty of an offence unless there is added to that mark or description, in a conspicuous manner, the name of the country in which the goods were made or produced, with a statement that they were made or produced there."

Equipment for New Zealand

The *New Zealand Electrical Journal* states that electrical equipment valued at over £90,000 was recently inspected in England by the High Commissioner for New Zealand, Mr. W. J. Jordan. The machinery, which is nearing completion, includes two 28,000-HP turbines for Waikaremoana, one of 36,000 HP for Highbank and a 28,000-kVA generator and control equipment for the same station.

Further contracts valued at between £200,000 and £300,000 are expected to be placed by the Public Works Department this year.

During March last imports into New Zealand of electrical apparatus (excluding wireless) were valued at £175,082, against £69,304 in February and £114,186 in March, 1940. The United Kingdom was again the principal supplier, having provided electric motors to a value of £21,249 out of a total of £22,914; electric lamps valued at £8,438 (total £8,997); insulated wire and cable, £32,671 out of £37,390; and ranges £1,841 out of £1,881. A good proportion of the wireless apparatus also came from the United Kingdom.

Road Transport Guide

There are no doubt many firms in the electrical industry who from time to time desire to send goods from one part of the country to another and find it difficult to arrange the necessary transport. A valuable production to keep handy for such emergencies is the "Goods Road Services Guide," published half-yearly in conjunction with *Motor Transport*.

This 124-page Guide contains extensive lists of daily and other regular road services for goods, covering every sizeable town in the country; also supplementary lists of clearing houses, and of contractors who can handle machinery, liquids or exceptionally bulky loads. The price is 1s., and copies of the July issue may be obtained by order from any newsagent, or post free from the publishers, Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

Workshop Calculations

A concise course in practical arithmetic is provided by a little "Handbook of Workshop Calculations," published by the Stationery Office (3d. net) under the auspices of the Board of Education and the Ministry of Labour. It is designed primarily for men and women undergoing training in the engineering industry, and its forty pages contain graduated exercises and answers, diagrams and worked examples. The earlier part explains the fundamental arithmetical processes and leads up to instruction in and examples of angular measurement, areas, volumes and weights.

Boxes of "Osram" lamps being taken from store for shipment overseas. (*Times* photograph.)

Protection of Essential Plant

In answer to an inquiry made by the Association of British Chambers of Commerce as to the arrangements to enable contractors and sub-contractors to carry out any necessary measure for the protection of essential plant, the Ministry of Supply states that the factories formally required to take measures under the Act for the protection of essential plant are paid a grant of 35 per cent. The *Chamber of Commerce Journal* explains that the exact procedure for additional assistance is fully explained in a memorandum recently revised, and in the form for claiming such assistance. Copies are expected to be available within a few days.

Oil Engine Costs

A report, to be introduced by Mr. C. Green, on heavy-oil engine working costs during the year 1939–40 is to be discussed at a meeting of the Diesel Engine Users' Association to be held at 2.30 p.m. on July 30th at Caxton Hall, Westminster, London, S.W.1.

Wartime Plating Problems

Plating problems in relation to war production are to be discussed at a meeting of the Electro-depositors' Technical Society at 7.15 p.m. on July 14th at the Northampton Polytechnic, St. John Street, London, E.C.1 at which the chair will be occupied by Dr. H. J. T. Ellingham, the president.

Additions to "Black List"

The Board of Trade has made a new Order, which came into force June 26th, containing 149 additions to the "Black List" of traders in neutral countries with whom it is unlawful to have dealings of any kind. Further additions will be made in due course. The Order is being published by the Stationery Office (price 2d. net) under the title of the Trading with the Enemy (Specified Persons) (Amendment) (No. 9) Order, 1941 (Statutory Rules and Orders, 1941, No. 838).

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry informs us that the cost-of-living index figure on May 31st (100 per cent. above the 1914 level) will not involve any alteration in wages on the third pay-day in July.

Key Industry Duty Exemptions

The Treasury has made an Order under Section 10 (5) of the Finance Act, 1936, renewing until December 31st, 1941, the exemption from Key Industry Duty of all articles at present exempt. Copies of the Order, the Safeguarding of Industries (Exemption) No. 3 Order, 1941 (S.R. & O. 1941, No. 899) may be obtained from the Stationery Office.

Trade Announcements

The London sales office of the Sturtevant Engineering Co., Ltd., is now at Bush House, Aldwych, W.C.2 (Telephone, Temple Bar 1961), and the head office at 25, Worcester Road, Sutton, Surrey. (Telephone, Vigilant 2275; Telegrams, Sturtevant, Sutton.)

Mallinson Bros., electrical and radio engineers, are giving up their business at 10, Westgate, Halifax, for the duration of the war.

Increased Lamp Exports

Despite air raids, shipping and other wartime difficulties, we are informed, shipments of "Osram" lamps overseas have increased by over 50 per cent. The General Electric Co., Ltd., has made, and is still making, every effort to develop new markets in accordance with the Government's general export policy. Argentina in particular is a notable instance.

TRADE MARK APPLICATIONS

The following applications have been made for British trade marks, objections to which may be entered within a month of July 2nd:—

ASTER. No. 614,425, Class 11. Electric lamps (not for surgical or curative purposes). Thorn Electrical Industries, Ltd., 105–109, Judd Street, London, W.C.1.

THE MANOR (design). No. 614,820, Class 11. Cooking stoves and heating apparatus Ernest Elwood, trading as the Manor Electric Oven & Fire Co., Ltd., 175, Windsor House, Victoria Street, London, S.W.1.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Small motor marked "GMC" or "GMD" in circle.

Inventum Electrical Appliances (present address).

BLOWER CLEAN hot air blower.

BARO still.

ELECTRICITY SUPPLY

Birmingham's Sound Position. Manchester and Coal Transport Charges.

Birkenhead.—LOAN FOR MOTORS.—The Corporation Electricity Committee has obtained sanction to borrow £500 for consumers' motors.

TARIFF ALTERATIONS.—After a debate on whether electricity prices should be increased by 5 per cent. for domestic consumers and 10 per cent. for power consumers or by a general increase in the charges of 7½ per cent., the Town Council decided in favour of the latter proposal.

Birmingham.—ELECTRICITY UNDERTAKING'S HEALTHY POSITION.—The annual report of the City Electric Supply Department was this year curtailed in view of national considerations. At last week's meeting of the City Council, however, Alderman Sir Percival Bower, chairman of the Electricity Committee, stated that from a strictly financial point of view the undertaking was in an extremely healthy condition. Birmingham was one of the few undertakings in the country that had managed to get through so far without increasing tariff charges. He added that the Department was down to, if not below, its pre-war charges, and its efforts were constantly in the direction of trying to maintain that. Coal was an important factor. As the Department burned a million tons a year, Sir Percival pointed out that the slightest movement in price had a tremendous effect, but he was of opinion it would not be necessary to raise charges of electricity to the public unless something very untoward happened.

Blackburn.—ELECTRIC PUMP FOR SEWAGE WORKS.—The Corporation is installing an electrically-driven pump at the Samlesbury Sewage Works.

Budleigh Salterton.—SUPPLY TO PUMPING STATION.—The Urban District Council is to appeal to the Electricity Commissioners with regard to the terms offered by the East Devon Electricity Co. for the proposed further supply of electricity to the Kersbrook pumping station. The company has informed the Council that it is of the opinion that the statement made by the Chancellor of the Exchequer in the House of Commons on April 7th did not apply in the case of an individual consumer under a special agreement, and it was, therefore, unable to improve on the proposal made to the Council.

Burnley.—MAINS AND SWITCHGEAR.—The Electricity Committee has received sanction to loans of £3,628 for mains and £1,450 for switchgear.

Chester.—SHELTER LIGHTING.—The Town Council is to have electric lighting installed n 162 communal surface shelters, at an estimated cost of £2,252.

Dartford. — INCREASED CHARGES. — The Electricity Committee recommends the following increases in charges :—(a) ¼d. per kWh on all tariffs not subject to coal clause, with the exception of "all-in" prepayment, church lighting and A.R.P. services supplies; (b) 0.075d. addition to the basic price per kWh of No. 1 power tariff and the cinema and institutions tariff; and (c) the addition of 0.05d. per kWh metered to high-voltage consumers.

Durham.—RENOVATION OF SCHOOL INSTALLATIONS.—The County Education Committee has received the Board of Education's consent to overhaul and renew the electrical installations at the Bearpark School (£184) and Sherburn School (£199).

Ellesmere Port.—COUNCIL HOUSE INSTALLATIONS.—The Urban District Council has referred to the Housing Committee a suggestion that tenancy conditions concerning the installation of electricity in Council houses should be removed. It was stated that the Council had had a monopoly of gas supply for many years and it was not right to debar tenants from having something which might be more economical and efficient.

Eston (Yorks).—BULK SUPPLY AGREEMENT.—The Urban Council has concluded a draft agreement with the North-Eastern Electric Supply Co., Ltd., for a bulk supply. Under the agreement the Council will save £4,000 per annum.

Finchley.—SPARE CONVERTOR.—Approval has been received by the Town Council to the purchase of a spare convertor plant at a cost of £1,450.

Glasgow.—RE-WIRING POLICE STATION.—The wiring at Pollokshaws police station is to be renewed at a cost of £90.

The Corporation Police Committee has also arranged for the Electricity Department to undertake electrical work at the new police headquarters stores at a cost of £230, and also to provide electric cookers at the recruits' training centre at a cost of £83.

Kettering.—WATER HEATERS FOR COUNCIL HOUSES.—Electric water-heaters are to be installed in any of 65 Council houses whose tenants are prepared to pay 5s. per quarter.

SHELTER HEATING.—The Education Committee is contemplating wiring and fitting all school air raid shelters for electric heating, at an estimated cost of £1,300. The borough electrical engineer has been asked to submit a detailed estimate for submission to the Board of Education.

London.—NEW J.E.A. TRANSMISSION LINE.—The Electricity Commissioners have sanctioned the construction by the London and Home Counties Joint Electricity Authority of a main transmission line. Tenders have been considered and the Technical Committee of the J.E.A. has accepted that of British Insulated Cables, Ltd.

Manchester.—STREET LIGHTING.—A £10,000 scheme of modified street lighting nearing completion comprises 8,000 lamps and extends over 180 miles of streets, twice as much as last winter.

COAL TRANSPORT CHARGES.—The Electricity Committee has authorised its chairman, deputy chairman and chief engineer to approach certain undertakings in the North-West England area with a view to formulating a scheme for presentation to the Mines Department for levelling down inequalities in transport charges for coal from districts other than those normally supplying the North-West area and to take any further action that may be deemed necessary.

LOAN SANCTIONED.—Among loans recently sanctioned by the Electricity Commissioners is one of £10,000 for substations and equipment.

Southport.—SERVICE CABLES TO BE PAID FOR.—The Corporation Electricity Committee has decided that during the present emergency the practice of allowing prospective consumers 30 ft. of service cable free of charge on private property shall be discontinued, and that all service cable laid on private property shall be charged for, and that the length of distributing mains cable laid free of charge in connection with mains extensions shall be reduced from 100 to 50 yd.

PLANT FOR BIRKDALE.—The Electricity Committee is seeking sanction to borrow £4,460 for plant for the Birkdale undertaking, which was recently acquired by the Corporation.

Grampian Bill Postponed

IT has been decided to postpone the second reading of the Grampian Electricity Supply Order Confirmation Bill until the Committee of Privileges of the House of Commons has reported upon a complaint made regarding comments upon earlier proceedings on the Bill.

The Parliamentary Correspondent of *The Times* says that it seems increasingly doubtful whether the motion will obtain a second reading as more than a hundred members have put their names down in support of Mr. Keeling's motion for its rejection.

The Grampian Electricity Supply Co. has circulated a statement to Members of Parliament, in which it stresses the benefits which would be derived from the Glen Affric scheme.

PURCHASE OF METERS.—The Corporation Electricity Committee is to obtain sanction to utilise £1,800 of surplus revenue for the purchase of meters.

NO CONCESSION YET FOR BOMBED PREMISES.—Until a lead is given by the Government, the Electricity Committee is to take no action in the matter of making allowances in respect of electricity consumed on property affected by enemy action.

Swindon.—HOUSING ESTATE SUPPLY.—The Electricity Committee is to provide supply to a housing estate at a cost of £2,900.

York.—DEARER COAL PROSPECT.—The Electricity Committee reports notification by the Ministry of Mines that it may be necessary for the electricity undertaking to take supplies of coal from Northumberland and Durham coalfields, instead of from Yorkshire coalfields, and states that this will involve a considerable increase in the cost of coal to the undertaking.

TRANSPORT

Bolton.—REVISED FARES.—Revised tram and bus fares and stages have been approved by the Corporation Transport Committee and the Town Council, and will come into operation when they have been sanctioned by the Ministry of Transport and the Regional Transport Commissioner. The General Manager pointed out in his report that there had been no increase in fares during the war though the Department had to meet extra cost for wages and changes in working conditions, fuel oil, electricity, and maintenance and material amounting to £54,633 a year. The scheme aims at an approximate standard of 1d. a mile.

Glasgow.—A PROSPEROUS YEAR.—Last year the tramways showed a surplus of £127,626, against a deficit of £4,269 for the preceding year. There was a loss of £37,725 on the buses (£72,465), while the underground also showed a deficit of £67,862 (£13,969). The full traffic receipts totalled £2,713,357 as compared with £2,358,022 in the previous year. Ordinary expenditure at £2,132,266 is £215,000 higher. It should be noted that during the year reconstruction work on the underground caused a suspension of service for some time.

Leeds.—WORKMEN'S HALFPENNY FARES DISCONTINUED.—The City Transport Committee is to discontinue the issue of halfpenny fares for workmen.

London.—POSTPONEMENT OF WORKS.—The London Passenger Transport Board has applied to the Ministry of War Transport for an Order under the Special Enactments (Extension of Time) Act, 1940, extending by three years the time laid down for the acquisition of property and the carrying out of a number of works under its Acts. Copies of the draft application are obtainable from the Solicitor (General) of the Board, 55, Broadway, Westminster, S.W.1 (price 6d.). Representations against the Order must be made by July 25th.

Sheffield.—INCREASED FARES.—A new scale of fares recommended by the Corporation Transport Committee includes a general advance from 1½d. to 2½d. on most routes. An increase of £95,000 per annum in tramway receipts is anticipated.

West Hartlepool.—DISPOSAL OF PROFITS.—A move that the profits of the Transport Department for the past year, amounting to £5,180, should be equally divided between the undertaking's reserve fund and the rates was defeated at a meeting of the Town Council. It was agreed that £4,000 should go to the reserve and the remainder to the general rates. Councillor F. B. Magee said that the ratepayers, who had shouldered a heavy burden when the undertaking was losing money, were entitled to more than 20 per cent. of the profits. He contended that the undertaking's reserve fund was big enough, but it was pointed out that it was now necessary, more than ever, to build up substantial reserves to meet wear and tear.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specifications (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

18949. "Selenium rectifiers, and method of producing the same." Nürnberger Schraubenfabrik Ges. June 1st, 1939. (537251.)

25466. "Aerial arrays." E. W. Hayes. September 8th, 1939. (537215.)

25595. "Dynamo-electric machines." J. H. Holmes & Co., Ltd., J. W. Bayles and C. T. Webster. September 11th, 1939. (537104.)

26875. "Electric furnaces for metallurgical purposes." Allmänna Svenska Elektriska Aktiebolaget. October 3rd, 1938. (Addition to 499437.) (537216.)

27060. "Electron beam discharge devices." Marconi's Wireless Telegraph Co., Ltd. October 1st, 1938. (537217.)

27590. "Refrigerating apparatus." Hoover, Ltd. January 25th, 1939. (Cognate application, 27591/39.) (537258.)

28482. "Cathode-ray apparatus." L. J. Blumenthal and A. Perelmann. October 23rd, 1939. (537175.)

29807. "Electrical impulse generators." Standard Telephones & Cables, Ltd., R. M. Barnard and W. Kram. November 10th, 1939. (537142.)

31185. "Actuating devices for manually-operated apparatus." Plessey Co., Ltd., and H. Da Costa. November 30th, 1939. (537145.)

31540. "Electro-acoustic means for producing sound effects." G. M. Wright. March 27th, 1939. (537177.)

31640. "Radio self-indicating bearing finders." Telefunken Gesellschaft für Drahtlose Telegraphie. December 6th, 1938. (537118.)

31642. "Spark plug and method of making the same." L. Mellersh-Jackson. (Aeroflex Laboratories, Inc.) December 6th, 1939. (537228.)

31703. "Time base circuits for cathode-ray tubes." Standard Telephones & Cables, Ltd., and W. A. Montgomery. December 7th, 1939. (537119.)

31716. "Turbine blading." Allis-Chalmers Manufacturing Co. February 23rd, 1939. (537121.)

31897. "Blocking layer cells." Philips Lamps, Ltd. December 12th, 1938. (537126.)

31898. "Blocking layer rectifiers." Philips Lamps, Ltd. December 12th, 1938. (537233.)

31952. "Closing mechanism for an electric circuit-breaker." British Thomson-Houston Co., Ltd., and M. C. I. Hunter. December 11th, 1939. (537180.)

31980. "Retainers for use in electric accumulators." Chloride Electrical Storage Co., Ltd. (C. A. Hall). December 11th, 1939. (537181.)

32024. "Temperature correction devices for watt-hour meters and like instruments." Venner Time Switches, Ltd., S. J. Matthews and A. W. Dean. December 12th, 1939: (537128.)

32025. "Temperature correction of watt-hour meters and other instruments." Venner Time Switches, Ltd., S. J. Matthews and A. W. Dean. December 12th, 1939. (537129.)

32066. "Control systems for electrical apparatus, more particularly gate-end boxes for coal mining machinery." C. T. Scarf, H. Hesketh, P. R. Heaton and Metropolitan-Vickers Electrical Co., Ltd. December 12th, 1939. (537240.)

32079. "Brush-gear of dynamo-electric machines." J. R. Jones. December 12th, 1939. (537242.)

32094. "Dynamo - electric machines." British Thomson-Houston Co., Ltd. December 13th, 1938. (537130.)

32099. "Electrically insulating bushings or sleeves." A. Reyrolle & Co., Ltd., I. W. A. Kirkwood and P. D. Ritchie. December 13th, 1939. (537268.)

32813. "Electron-discharge devices incorporating electron multipliers." Standard Telephones & Cables, Ltd. December 29th, 1938. (537276.)

1940

181. "Electric heating devices." W. Engel and J. A. Howard. January 3rd, 1940. (537190.)

197. "Coal-cutting machines." A. Anderson and Anderson, Boyes & Co., Ltd. January 3rd, 1940. (537280.)

430. "Brake magnet adjustment means for watt-hour meters and like instruments." Venner Time Switches, Ltd., and S. J. Matthews. January 8th, 1940. (537133.)

1246. "Line drop compensators." British Thomson-Houston Co., Ltd. January 20th, 1939. (537285.)

1347. "Wrapping device for an annular package." W. T. Henley's Telegraph Works Co., Ltd., and C. A. Walker. January 23rd, 1940. (537287.)

1864. "Cooling of dynamo-electric machines." English Electric Co., Ltd., and E. A. Binney. January 30th, 1940. (537191.

2252. "Detachable reflectors of electric light fittings." F. W. Thorpe, Ltd., and F. W. Thorpe. February 6th, 1940. (537192.)

3483. "Adjustable standard lamps." Cornercroft, Ltd., and N. Rycroft. February 24th, 1940. (537194.)

3613. "Circuit-breakers and the like electro-magnetically operated switches." Whipp & Bourne, Ltd., and F. Whipp. February 27th, 1940. (537195.)

3944. "Control of the motors of battery electric vehicles." British Thomson-Houston Co., Ltd., and J. H. Cansdale. March 2nd, 1940. (537150.)

4719. "Electrical connectors." J. S. Maclean. March 13th, 1940. (537248.)

6105. "Superheaters for tubulous boilers." Stirling Boiler Co., Ltd., and C. W. Townsend. April 4th, 1940. (537198.)

6922. "Method of and means for use in welding by the electric arc process." G. D. Peters & Co., Ltd., and R. Needham. April 17th, 1940. (Cognate application, 7310/40.) (537164.)

7048. "Directional lighting installations." Philips, Lamps, Ltd., April 21st, 1939. (537165.)

7431. "Excess voltage protective electrical discharge devices." Westinghouse Electric International Co. April 29th, 1939. (537200.)

7789. "Crystal controlled oscillator." Standard Telephones & Cables, Ltd. May 3rd, 1939. (537167.)

7931. "Manufacture of storage battery separators." R. A. Rothermel. May 2nd, 1940. (537250.)

8021. "Safety switch mechanism for electric wash boilers and the like." J. H. Tucker & Co., Ltd., and F. C. Fuke. May 4th, 1940. (537203.)

9198. "Means for the automatic synchronisation and speed control of power plants." British Thomson-Houston Co., Ltd. May 24th, 1939. (537169.)

9349. "Telephone and like signalling systems." Electrical Research Products, Inc. July 11th, 1939. (537205.)

12469. "Electric current transformers." British Thomson-Houston Co., Ltd. August 2nd, 1939. (537206.)

13469. "Photographic shutters having built-in flashlamp synchronising devices." Kodak, Ltd. January 23rd, 1940. (537208.)

13470. "Photographic shutters having built-in flash-lamp synchronising devices." Kodak, Ltd. January 26th, 1940. (537209.)

Safeguarding Food Stores

Methods Adopted by Large Provision Merchants

FOOD supply is vital to our prosecution of the war, and consequently every precaution must be taken to protect our food stocks from enemy action. In this electricity inevitably must play a big part and a few days ago Mr. Ralph Hall, engineer to J. Sainsbury, Ltd., took us to see some of the safeguards which his company has recently instituted at one of its large cold storage depots.

Here temperatures of 14–16 deg. F. or even lower have to be maintained continuously and while the insulation is sufficiently good to ensure that no damage is done to the stores if the refrigeration system is shut off for about twelve hours, it is essential that the apparatus should not be out of service for much longer periods than this.

For some time two distinctly separate feeds of 420-V 3-wire DC entering the building at opposite ends have given a certain degree of security from breakdown, but in view of the possibility of the DC generating plant being put out of action, it was thought desirable to have available an alternative supply of standard 400/230-V 3-phase 50-cycle AC which, in view of the grid arrangements is, it is considered, unlikely to be unobtainable for more than very short periods.

To provide this, however, without having to make extensive alterations to the refrigeration and other plant, it was necessary to have a rectifier installed. As this is purely a stand-by equipment the company had to bear the whole cost, but it is felt that this is well worth while in the circumstances, and in any case the apparatus is likely to be readily saleable for other purposes after the war.

The type of equipment chosen was a standard Nevelin twin-bulb rectifier set comprising two 100-kW six-arm bulb units mounted in separate cubicles bolted together and each controlled by a 300-A single-pole DC circuit-breaker permitting either or both units to be employed. The 230/320-kVA 3/6-phase transformer has an interphase unit and a tertiary winding to supply independent auxiliary circuits. Actually the total horsepower of the electric motors installed in the stores is between 500 and 600, but the 200 kW provided by the rectifiers is quite sufficient to permit the building to carry on in emergency.

Protection of Rectifiers

In installing the rectifiers every care has been taken to guard against possible damage from high-explosive bomb blast. Besides being situated in a basement (actually the old engine room), they are protected by stacks composed of cartons of 4-in. slab cork (as used for the insulation of the cold rooms), which is found to provide a very effective screen.

The maintenance of water supplies for the refrigeration plant is another problem which the company has had to face. To enable the plant to be run when no water is available after a raid in the neighbourhood, a York Shipley economiser (air-cooled) condenser is now being installed, which, unlike the water-cooled units, needs scarcely any water to operate—actually only a bucket or two a day. This is driven by a 2-HP motor.

FINANCIAL SECTION

Company News. Liquidations and Bankruptcies. Stock Exchange Activities.

Reports and Dividends

Callender's Cable & Construction Co., Ltd., after providing for taxation, reports a balance to the credit of profit and loss account of £428,774, as compared with £440,908 for 1939. After meeting depreciation, debenture interest and preference dividends there is a balance of £279,274 (against £301,408) to which is added £398,369 brought forward, making £677,643. The ordinary dividend is maintained at 15 per cent. by a final payment of 10 per cent., £6,538 (against nil) is put to reserve account and £125,000 (same) to reserve for equalisation of dividends or for war contingencies, leaving £377,518 to be carried forward.

The directors state that the reduction in profit is due to the provision made for taxation. The company's works have been fully employed. A sum of £43,462 realised from the sale of certain investments has been added to the reserve account. The report refers with regret to the death of Mr. T. O. Callender. In view of the present conditions it has been decided that at the annual meeting on July 11th there shall be no chairman's speech or any other business than the purely formal resolutions.

The Chloride Electrical Storage Co., Ltd., announces that the trading profit for the year to March 31st last was £447,009, as compared with £402,644 in 1939–40. Income tax absorbs £44,000 more and the net earnings at £277,941 are only about £4,000 up. The dividend on the "A" and "B" ordinary shares for the year is maintained at 15 per cent. by the payment of a final dividend of 5 per cent. plus a bonus of the same amount. The general reserve receives £75,000 (including £11,622 received from a subsidiary's capital distribution), £2,392 is written off shares in subsidiaries, £32,000 is put to pensions and benefits funds and a balance of £83,104 is carried forward. The directors have applied a further £75,000 out of general reserve to write down shares in subsidiaries. The book value of shares in a "sub-subsidiary" company in German-occupied territory has been written off. The report makes reference to the death in January last of Mr. D. P. Dunne, the company's managing director.

The Revo Electric Co., Ltd., states that the trading profit for the year ended March 31st last amounted to £185,517, an increase of £95,240 as compared with 1939–40. The provision for taxation is increased from £42,711 to £117,410. A final dividend of 10 per cent., with a bonus of 5 per cent., is recommended, making 20 per cent. for the year, against 5 per cent. Reserve receives £25,000 and £79,369 (against £88,996) is carried forward. The directors state that the bonus is being paid in view of the reduction in the dividend for 1939–40; it is not to be regarded as a regular annual payment.

The Morgan Crucible Co., Ltd., reports a net profit of £779,341 for 1940–41 (including £70,842 from a specific reserve now no longer required), against £801,429 for the preceding year. Tax provision is raised from £428,321 to £533,838 and £70,842 (against £71,934) is put to general reserve. An ordinary dividend of 10 per cent. (against 8¼ per cent.) is being paid and £2,275 (against £825) is carried forward.

The Brazilian Traction, Light & Power Co., Ltd., reports that during 1940 the various services undertaken by the company showed further growth. There were increases in the number of passengers carried by the transportation services of 4.74 per cent., in sales of electricity of 6.62 per cent., in gas sales of 9.32 per cent., and in telephone services of 7.40 per cent. Some headway has at last been made in the long-outstanding matter of adjustment of rates: increased rates were authorised during the past year for both the gas supply and the telephone service in the Federal District of Rio de Janeiro. Combined gross earnings, in fact, increased from U.S. $37,199,350 in 1939 to $37,737,986 in 1940. But for the most part increases in operating costs, resulting mainly from the war, offset the additional revenue and the net revenue of Brazilian Traction itself was only $93,699 larger at $9,259,807. After providing for preference dividends this is equivalent to $1.31½ a share, against $1.30 a year ago, but again no ordinary dividend is paid, due to the difficulty of making remittances.

The Oriental Telephone & Electric Co., Ltd., has declared a final ordinary dividend of 11 per cent., less tax, against 7½ per cent., free of tax, making 16 per cent., less tax, against 11½ per cent., free of tax, for 1939. The net profit is shown at £130,466, as against £113,881, but it is noted that the figures are not comparable owing to the fact that dividends on the ordinary shares have been declared or recommended gross, subject to the deduction of income tax. Consequently, the taxation charge in the profit and loss account has been reduced and the balance of profits increased.

The Mexican Light & Power Co., reports a revenue from operations in Mexico of $1,336,474 (Canadian) for 1940, against $1,024,013 for 1939. There is a credit balance of $320,896 after meeting general expenses and interest on first mortgage bonds, but the unpaid interest on other bonds and stock amounts to $1,206,727, creating a debit balance of $885,831 (against $1,365,350). It is hoped to call meetings shortly for the purpose of submitting a plan.

The Mexican Tramways Co. incurred a net loss of $221,462 (Canadian) in 1940, against $459,447 in the preceding year. After providing for sundry charges and credits the net loss for the year was $328,395, raising the accumulated deficit to $9,598,832.

The Telephone Manufacturing Co., Ltd., is again paying a final dividend of 6½ per cent., making 9 per cent. for the year, as last year.

The Western Telegraph Co. is maintaining its ordinary dividend at 7½ per cent. by a final payment of 4¾ per cent.

Mirrlees, Bickerton & Day, Ltd., have again declared a dividend of 6 per cent. for the past year.

The General Cable Manufacturing Co., Ltd., is to maintain its interim dividend at 6 per cent.

The Hydro-Electric Securities Corporation, Ltd., proposes to pay the half-yearly dividend on its 5 per cent. "B" cumulative preference participating shares.

West of England Electric Investments, Ltd., report a net revenue of £69,599 for 1940-41, as compared with £66,713 in the preceding year. The dividend is maintained at 7 per cent., and the balance carried forward rises from £17,919 to £28,018.

New Companies

Ellis P. White, Ltd.—Private company. Registered June 23rd. Capital £5,000 in 5,000 shares of £1 each. Objects: To salvage, buy, repair, renew and deal in electrical batteries, to manufacture and deal in (by wholesale and retail) electrical accumulators, batteries, acids, containers, magnetos, transformers, etc. The directors are: E. P. White, 20, Pytchley Crescent, S.E.19 and H. Fishman, 11, Margaret Street, W.1. Registered office: 18/21, Marshall Gardens, London Road, Southwark S.E.1.

Nelson, North, Ltd.—Private company. Registered June 26th. Capital £500. Objects: To carry on the business of electrical, wireless, mechanical and general engineers and dealers, etc. Directors: N. Nelson, 89, Greenhill Road, Manchester and J. C. North, 29, Craigwell Road, Prestwich. Registered office: 39, High Street, Manchester, 4.

Companies' Returns

Statements of Capital

Telephone & General Trust, Ltd.—Capital £1,300,000 in £550,000 cumulative preference stock, £627,000 ordinary stock and 100,000 "A" ordinary and 23,000 ordinary shares of £1. Return dated May 5th, 1941. All preference and ordinary stock and 100,000 "A" ordinary shares taken up, £1,200,517 6s. paid (£1 on £307,327 preference; £1 1s. on £240,000 preference and £1 2s. on £2,673 preference stock; £1 5s. on £285,000 ordinary stock; and £1 on £182,000 ordinary stock and 100,000 "A" ordinary shares). £160,000 considered as paid on £160,000 ordinary stock. Mortgages and charges: £800,000.

Macintosh Cable Co., Ltd.—Capital £250,000 in £1 shares. Return dated February 27th. 500 shares taken up. £500 paid. Mortgages and charges: Nil.

Helsby Cables, Ltd.—Capital £2 in £1 shares. Return dated February 26th. 2 shares taken up. £2 paid. Mortgages and charges: Nil.

West Gloucester Power Co., Ltd.—Capital £885,000 in £518,500 6 per cent. preference stock, £303,500 ordinary stock and 63,000 £1 ordinary shares. Return dated May 21st. All preferred and ordinary stock taken up. £587,500 paid on £518,500 preference and £69,000 ordinary stock. £234,500 considered as paid on £234,500 ordinary stock. Mortgages and charges: £541,450.

Mortgages and Charges

Westool, Ltd.—Charge on moneys due or to become due to the company, dated June 4th, 1941, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Kelvin-Norton Electric Co., Ltd.—Charge on moneys due under certain contracts, dated June 17th, 1941, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

Mersey Power Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital (subject to £234,150 outstanding under trust deed dated January 5th, 1934), dated June 3rd, 1941, to secure all moneys due or to become due from the company to Westminster Bank, Ltd.

Underwood (Electric), Ltd.—Assignment of all moneys due or to become due under certain contracts, dated June 11th, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £2,200.

Assignment of all moneys due under certain contracts, dated June 18th, 1941, to secure all moneys due or to become due from the company to MartinsBank, Ltd., not exceeding £18,000.

Receiver Released

Exceller Manufacturing Co., Ltd.—G. M. Duncan, Aldwych House, W.C.2, ceased to act as receiver on June 13th.

Liquidations

Jackson & Boyce, Ltd.—Winding up voluntarily. Liquidator, Mr. B. Collett, 10, Byron Hill Road, Harrow-on-the-Hill, appointed June 25th. Particulars of claims to be sent to the liquidator by July 16th. (This notice is purely formal; all outstanding creditors will be paid in full.)

E. C. Stokes, Ltd.—Meetings of creditors and members at Mitre House, 13–15, High Street, Sutton, Surrey, August 2nd, to hear an account of the winding-up by the liquidator, Mr. M. Andrews. (It should be noted that this is not E. C. Stokes (1940), Ltd., of Sutton.)

Berners Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. E. Maloney, 11, Ironmonger Lane, London, E.C.2.

British Lamp Works, Ltd.—Particulars of claims by July 28th to the liquidator, Mr. N. T. Fedrick, 3–4, Clements Inn, Strand, London, W.C.2.

L.B. & D. Electrical Co., Ltd.—Meetings, pursuant to Section 245 of the Companies Act, 1929, on August 6th at 185–188, High Holborn, London, W.C.1, to receive an account of the winding-up by the liquidators, Messrs. C. Latham and S. Sharpe.

Henri Selmer & Co., Ltd.—Meeting, pursuant

(*Continued on page* 822)

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange prices are maintaining their previous levels with a surprising degree of firmness. War Loan and other British Government securities have been steadily advancing under the pressure of purchases by people who are convinced that the next British Government loan, likely to be floated in the near future, will be on terms that compare unfavourably—to the lender—with those at present available. Gilt-edged stocks of all classes reflect the strength shown by British Government stocks. London Power 5 per cent. debenture is 10s. higher; London Passenger Transport "A" stock is up a point. The only weak spot in the various groups quoted in our lists this week is Cable and Wireless Ordinary, where the price has receded to 59. The ordinary shares in the equipment and manufacturing lists show a large preponderance of improvements over declines.

Forthcoming Railway Dividends

As already stated, the Home Railway companies are due to announce on July 25th the interim dividends for the first half of the current year. The five different companies will issue their statements on the same day. Advance estimates as to what these are likely to be have been based upon the payments made a year ago, when Transport "C" stock received 15s. per cent. and Southern preferred 2½ per cent. The Transport "C" dividend for the year was made up to 3 per cent. Possibly the Board may elect to divide a little more equally the sums which will, it is assumed, repeat the 3 per cent. dividend for the whole of last year.

Hopes that the Government will announce its intentions with regard to the agreement with the railway companies, have again to be carried forward. Home Railway market prices are steadily maintained. Southern preference is better at 96½. Central London guaranteed assented has hardened to 67. Transport "C" at 37 is 1 up.

Subsidies ?

It may be of interest to point out that within the past week the prices of various stocks and shares connected with gas companies have been rising, after they had spent an unhappy couple of months due to passing of its preference dividends by the Gas, Light & Coke Co. The recent recovery in prices is due to a rumour, very vague, to the effect that the Government may grant a subsidy to gas and other utility companies if circumstances seem to warrant it. This was quite enough to bring about a sharp rally. Also it served to send inquiries into the market for Home electricity supply shares, as to whether there was any likelihood of similar treatment being extended to the electricity supply undertakings.

Electricity Industry's Strength

The immediate answer is that electricity supply companies are not at all likely to require any assistance from outside. The financial position of most of them is so well established that any offer of aid in the shape of a subsidy would be superfluous. The industry as a whole stands in the enviable position of rewarding its financial supporters liberally and constantly. For prices of the ordinary shares to have risen as they have done for the past two or three weeks, in the face of war news that can scarcely be called very hopeful, is something for the market to boast about, and it will be observed from reference to our price lists, that the tendency is still, as the Stock Exchange says, "better for choice." Last week's improvements are all held and this time gains are shown by Lancashire, Midland Counties, North Eastern, City of London, Electric Supply and Isle of Thanet ordinary shares. Richmond (Surrey) have risen to 20s.

Tokyo Electric sixes are up 2 to 35½, in sympathy with a rise in Japanese Government bonds. A hazy notion prevails that Japan is dissatisfied with her position in the Axis and has no intention of entering into any active pact with her partners.

Fluctuations in Prices

Reyrolle shares show a rise of ⅛ to 55s. Hopkinsons at 46s. 3d. put on 2s. 3d., buyers being attracted by the comparatively high rate of yield which is still obtainable, at the price just quoted of 6½ per cent. E. K. Cole are a further 3d. better at 7s. Electric & Musical Industries strengthened to 11s. 3d., anticipation looking for a 10 per cent. dividend in the forthcoming autumn. Telegraph Condensers went a little lower to 11s. 3d. Telegraph Manufacturing 5s. shares at 7s. 3d. were unaffected by repetition of the usual 9 per cent. dividend for the year. Laurence, Scott shares at half-a-guinea are better on the week and for Ever Ready there has been a fair amount of inquiry which raised the price to 28s. Ferranti 7 per cent. preference shares are up 1s. 3d. to 26s. 3d.

Cable and Wireless

Cable and Wireless preference stock continues to be in request at 100 and thereabouts. The price of the ordinary receded 2 points to 59 on a few sales from holders who had been disappointed with the dividend, but who had refrained from realising their stock until the price went ex dividend. At the recent meetings, stress was laid by the chairman upon the fact that no decision had yet been reached with regard to E.P.T. in respect of some of the subsidiaries. The Eastern Extension has declared a final dividend making 7½ per cent. for the year, and, as already notified, the Eastern Telegraph's dividend for the year is made up to 11½ per cent. The Western Telegraph is paying 7½ per cent., all these rates being the same as those of last year. Canadian Marconi are a little better at 5s. 6d. Anglo-American Telegraph preferred and ordinary are both higher on the week.

E.P.T. Uncertainties

The uncertainty as to E.P.T. liability acts detrimentally, not only to Cable and Wireless stocks, but to the shares in a number of industrial companies. Directors declare interim dividends without hesitation; but when it comes to the final distribution, they are, in many cases, reluctant to fix the rate without knowledge of their company's obligation in the way of E.P.T. The delay which occurs over these questions may be necessary, but it is certainly also regrettable. Proprietors of shares in companies which delay declaration of final dividends may find in this explanation the reason why dividend cheques are not always forthcoming at the regular dates.

Electric Construction

The Electric Construction Co. makes a striking example of the manner in which taxation eats into increased profits. The company for the year ended March last, raised its net profit by £34,900, but provision for taxation was also increased by £33,000. The balance carried forward absorbed a further £4,700 at £30,000, with the result that the dividend on the ordinary shares is maintained at 10 per cent. The excellence of the results brought in buyers of the shares and the price is 3s. 9d. up at 32s. 6d.

Dividends and Reports

In the Stock Exchange market, Callender's report was read as being very satisfactory. The decrease of £22,000 in the net profit as compared with a year ago is due entirely, of course, to taxation. The company's financial position is strengthened and obviously Callender's are full of work. The shares can be regarded as a first-rate industrial investment.

The Anglo-Portuguese Telephone Co. increased its revenue last year; the net profit increased by about £3,000. The price of the shares remains at 12s. 6d., at which the return on the 8 per cent. dividend now declared is 12½ per cent. It is of interest to notice that the company's 5 per cent. first debenture stock, dated 1947–67, changed hands the other day at 79.

Whitehall Electric preference strengthened to 12s. on the issue of a report which was considered to be reasonably good. The net income came to £23,600 better than that of the previous twelve-month.

A rise of 2s. 6d. lifted Pye deferred shares to 13s. 9d. on the impression that the usual 25 per cent. dividend will be forthcoming at the end of the present month.

Traction and Transport

Tilling & British Automobile ordinary strengthened to 50s., shares changing hands up to 52s. on a demand which, while small in scale, came upon a market barely supplied with shares. The company's last dividend was 7 per cent. tax-free, comparing with 8 per cent. tax-free in the previous year. A rise of 15 in British Electric Traction deferred and 20 in the preferred ordinary stock, lifted the prices to 815 and 180 respectively. Lancashire Transport are a better market at 40s., the highest price touched this year. More interest is being turned to Argentine stocks and shares, but up to the present this has not affected Anglo-Argentine Tramways, where the price of the 4 per cent. income stock remains at 6.

Brazilian Tractions

Brazilian Traction shares, once amongst the most popular shares in the American market, have fallen from that estate and nowadays attract comparatively little attention, either in London, New York or Montreal. The last-named centre is assumed to take more interest in Brazilian Tractions than the other exchanges do. The shares enjoyed a good deal of support, in days gone by, from the Continent. The company has just issued its annual report, which shows that the earnings for the year were a few cents per share higher than those of the previous twelvemonth. The company is earning about 1.31 American dollars on the common stock, but as Brazil is very loath to part with money, either in dollars or in sterling, it looks as though holders of the shares will have to go without cash payment for some time to come yet. The price has improved to 7½, which is half a point higher on the week.

Oriental Telephone

The Oriental Telephone and Electric Co. is one of the latest companies to declare its dividend less tax, instead of tax-free. The company's final dividend of 11 per cent. makes 16 per cent. less tax as against 11½ per cent. tax-free a year ago. The net profit of £130,400 is about £17,000 down on the year. The price of the shares, 56s. 3d., is unaffected by the change in the method of dividend distribution.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1941 High-est	1941 Low-est	Dividend Pre-vious	Dividend Last	Middle Price July 7	Rise or Fall	Yield £ s. d. p.c.
Home Electricity Companies							
Bournemouth and Poole	48/6	45/–	15	12½	47/6	..	5 5 3
British Power and Light	27/9	23/–	7	6	24/6	..	4 18 0
City of London	22/6	20/–	7½	7	22/6	+6d.	6 4 3
Clyde Valley	36/6	33/6	8	8	34/6	..	4 12 9
County of London	34/6	30/–	10½	8	31/3	..	5 2 5
Edmundson's:							
7% Pref.	31/–	25/6	7	7	30/9	..	4 11 1
Ord.	26/–	23/6	6	6	26/–	..	4 12 4
Elec. Dis. Yorkshire	39/–	36/–	9	9	38/9	..	4 12 9
Elec. Fin. and Securities	42/6	39/–	12½	12½	42/6xd.	..	5 17 8
Elec. Supply Corporation	39/6	36/–	11½	10	39/6	+1/–	5 1 3
Isle of Thanet	8/–	6/–	2	Nil	8/–	+9d.	—
Lancs Light and Power	32/–	28/6	7½	7½	32/–	+6d.	4 13 9
Llanelly Elec.	21/–	19/6	5½	5½	20/–	+9d.	5 10 0
Lond. Assoc. Electric	16/6	12/6	5½	4½	15/9	..	5 14 3
London Electric	23/6	21/3	7	7	22/6	..	6 4 5
London Power Deb. Red.	105½	102	5	5	103½	+½	4 16 7
Metropolitan	34/6	31/–	10	8	32/6	..	4 18 6
Midland Counties	36/6	32/9	8	8	36/3	+6d.	4 8 5
Mid. Elec. Power	35/–	33/3	9	9	35/–	..	5 2 10
Newcastle Elec.	26/3	24/6	7	7	25/–	..	5 12 0
North Eastern Elec.:							
Ordinary	29/–	25/6	7	7	28/3	+9d.	4 19 1
7% Pref.	32/6	29/–	7	7	32/6	..	4 6 2
Northampton	2⅛	39/6	10	10	41/3	..	4 17 0
Notting Hill 6% Pref. (£10)	9	8	6	6	8½	..	—
Northmet Power:							
Ordinary	34/6	28/6	10	7	28/9	..	4 17 4
6% Pref.	29/6	27/3	6	6	29/6	..	4 1 4
Richmond Elec.	20/–	18/–	6	6	20/–	+⅛	6 0 0
Scottish Power	36/6	33/–	8	8	36/3	..	4 8 5
Southern Areas	16/6	14/6	5	5	16/3	..	6 3 0
South London	20/–	19/3	7	7	20/–	..	7 0 0
West Devon	21/6	20/9	5	5	21/3	..	4 14 1
West Glos.	18/3	17/3	4½	4½	17/6	..	5 2 10
Yorkshire Elec.	38/3	34/6	8	8	38/3	..	4 4 0
Overseas Electricity Companies							
Atlas Elec.	2/6	1/6	Nil	Nil	2/6	+6d.	—
Calcutta Elec.	37/3	33/–	8*	7*	35/6	..	3 19 0
Cawnpore Elec.	30/–	26/–	10	10	28/9	..	7 5 9
East African Power	25/6	21/6	7	7	25/–	..	5 12 0
Jerusalem Elec.	22/6	18/6	7	7	18/9	..	7 9 4
Kalgoorlie (10/–)	12/6	11/–	7½	7½	12/6	..	6 0 0
Madras Elec.	25/3	23/6	8*	6*	23/9	..	—
Montreal Power	31	24	1½	1½	24½	..	6 2 5
Palestine Elec. "A"	20/6	14/–	Nil	Nil	14/6	..	—
Perak Hydro-electric	18/3	16/3	2½	6	16/3	..	7 7 8
Shawinigan Power	18½	14	85cts.	90cts.	16½	..	—
Tokyo Elec. 6%	40½	33	6	6	35½	+2	16 18 0
Victoria Falls Power	76/6	69/6	15	15	75/–xd.	..	4 0 0
Whitehall Investment Pref.	14/9	8/3	7½	7½	12/–	+2/–	12 10 0
Public Boards							
Central Electricity:							
1950–70	110½	108	5	5	110½	..	4 10 6
1955–75	113½	109½	5	5	113	..	4 8 6
1951–73	108	105½	4½	4½	107	..	4 4 1
1963–93	101	94	3½	3½	100	..	3 10 0
1974–94	94	87⅜	3½	3½	94	..	3 9 2
London Elec. Trans. Ltd.	94	91½	2½	2½	93xd.	..	2 13 9
London & Home Counties							
1955–75	108	106	4½	4½	106xd.	..	4 5 0
Lond. Passenger Transport:							
A	120	109	4½	4½	114½	+1	3 18 4
B	114	102½	5	5	109½	..	4 11 4
C	38	29	1½	3	37	+1	8 2 2
West Midlands Joint Elec.							
1948–68	108½	103	5	5	108½	..	4 12 0
Telegraph and Telephone							
Anglo-Am. Tel:							
Pref.	104½	99	6	6	104½	+½	5 15 0
Def.	24	21	1½	1½	23½	+1	6 7 8
Anglo-Portuguese	17/6	12/6	8	8	12/6	..	12 16 0
Cable & Wireless:							
5½% Pref.	102	93	4½	5½	100	..	5 10 0
Ord.	68	52½	4	4	59	−2	6 15 7
Canadian Marconi $1	5/–	4/–	Nil	4cts.	5/6	+3d.	3 4 0
Globe Tel. & Tel.:							
Ord.	29/–	26/–	7½*	6*	27/6	..	4 7 3
Pref.	28/–	25/–	6	6	27/6	..	4 7 3
Great Northern Tel. (£10)	14	10½	20	20	12½	..	—
Inter. Tel. & Tel.	3½	2½	Nil	Nil	3	..	—
Marconi-Marine	25/–	19/9	7½	7½	25/–	..	6 3 0
Oriental Telephone Ord.	56/6	47/–	11½*	16	2⅛	..	5 14 0
Telephone Props.	11/6	11/–	6	6	11/3	..	10 13 4
Telephone Rental (5/–)	7/9	6/9	10	10	7/3	..	6 18 0

Company	1941 High-est	1941 Low-est	Dividend Pre-vious	Dividend Last	Middle Price July 7	Rise or Fall	Yield £ s. d. p.c.
Traction and Transport							
Anglo. Arg. Trams:							
First Pref. (£5)	2/3	1/–	Nil	Nil	2/–	..	—
4% Inc.	8½	4	Nil	Nil	6	..	—
British Electric Traction:							
Def. Ord.	830	740	45	45	815	+15	5 10 6
Pref. Ord.	180	150	8	8	180	+20	4 9 0
Bristol Trams	40/–	36/–	8*	8	36/3	..	4 8 5
Brazil Traction	8	6½	$1	50c.	7⅜	+½	—
Calcutta Trams	19/9	18/–	8	5½	18/–	..	6 2 3
Cape Elec. Trams	17/6	16/6	5	5	17/–	..	5 17 4
Lancs Transport	40/–	36/–	10	10	40/–	+⅛	5 0 0
Mexican Light:							
1st Bonds	40	34½	5	5	40	..	—
Rio 5% Bonds	85½	82½	5	5	85	..	5 17 8
Southern Rly.:							
5% Prefd.	55	43½	5	5	54½	..	9 3 6
5% Pref.	97	77½	5	5	96½	+1	5 3 9
T. Tilling	44/–	34/6	10	10	43/9	..	4 11 4
Tilling & B.A.	52/–	45/6	8*	7*	50/–	+2/6	2 16 0
West Riding	38/–	34/–	10	10	38/–	..	5 5 4
Equipment and Manufacturing							
Aron Electricity Ord.	18/6	16/–	15	Nil	18/–	..	—
Assoc. Elec.:							
Ord.	42/6	38/3	10	10	42/6	..	4 14 3
Pref.	36/–	33/3	8	8	35/–	..	4 11 5
Automatic Telephone & El.	47/3	32/–	12½	12½	45/–	..	5 11 1
Babcock & Wilcox	44/–	39/–	11	11	43/9	..	5 0 6
British Aluminium	44/–	39/–	12½	10	43/9	+⅛	4 11 4
British Insulated Ord.	88/3	78/9	20	20	85/–	..	4 14 1
British Thermostat (5/–)	12/6	10/6	18½	18½	12/6	..	7 8 0
British Vacuum Cleaner (5/–)	6/3	6/–	40	12½	6/3	..	—
Brush Ord.	4/3	3/6	Nil	Nil	3/9	..	—
Callender's	65/6	58/6	15	15	65/–xd.	+1/–	4 12 4
Chloride Elec. Storage	63/6	60/–	15	15	62/6	..	4 15 10
Consolidated Signal	65/–	60/–	17	17	62/6	..	5 8 7
Crabtree (10/–)	25/–	21/3	17½	17½	25/–	..	7 0 0
Crompton Parkinson:							
Ord. (5/–)	19/–	17/9	30	20	18/9	..	5 6 8
E. K. Cole (5/–)	7/6	2/9	10	Nil	7/–	+3d.	—
Elec. & Musical Industries (10/–)	11/6	7/3	5	Nil	11/3	+9d.	—
Electric Construction	33/–	25/–	10½	10	32/6	+⅛	6 3 0
Enfield Cable Ord.	51/–	45/–	16½	12½	45/–	..	5 11 3
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	..	5 0 0
English Electric	35/–	29/–	10	10	35/–	..	5 14 2
Ensign Lamps (5/–)	16/3	15/–	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)	37/3	35/–	25*	22*	35/–	..	3 2 10
Ever Ready (5/–)	28/–	25/–	40	40	27/9	+3d.	7 4 1
Falk Stadelmann	16/9	13/9	6	7	15/9	..	8 17 10
Ferranti Pref.	26/6	23/6	7	7	26/3	+⅛	5 6 10
G.E.C.							
Pref.	33/–	30/6	6½	6½	32/6	..	4 0 0
Ord.	84/–	77/–	20	20	82/6	−⅛	4 17 0
Greenwood & Batley	21/–	18/6	15	13	20/–	..	13 0 0
Hall Telephone (10/–)	14/–	10/–	15	10	13/9	..	7 5 6
Henley's (5/–)	21/6	19/6	20	20	21/3	..	4 14 1
4½% Pref.	21/6	20/–	4½	4½	21/3	..	4 4 8
Hopkinsons	46/6	37/6	15	15	46/3	+2/3	6 9 10
India-Rubber Pref.	21/6	19/6	5½	5½	21/3	..	5 3 6
Intl. Combustion	100/–	81/3	32½	30	100/–xd.	+6d.	6 0 0
J. Lucas	59/–	50/6	15	15	58/9	..	5 2 0
Johnson & Phillips	48/9	43/–	15	15	48/9	..	6 3 0
Lancashire Dynamo	53/6	50/–	20	20	52/6	..	7 12 5
Laurence, Scott (5/–)	10/6	7/6	15	15	10/6	+6d.	7 2 10
London Elec. Wire	25/6	20/–	7½	7½	22/6	..	6 13 4
Mather & Platt	40/–	32/–	13½	10	39/6	..	5 6 8
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	..	5 3 6
Murex	84/6	75/–	20	20	83/9	+⅛	4 15 8
Pye Deferred (5/–)	14/–	10/9	25	25	13/9	+⅛	9 1 10
Revo (10/–)	25/–	18/9	5	20	25/–	..	8 0 0
Reyrolle	55/–	47/9	12½	12½	55/–	+⅛	4 10 3
Siemens Ord.	22/9	17/–	7½	7½	21/3	..	7 1 2
Strand Elec. (5/–)	2/–	1/–	4	2	2/–	..	5 0 0
S. Smith (1/–)	7/9	5/9	37½	50	6/3	..	8 0 0
Switchgear & Cowans (5/–)	9/–	7/3	10	15	8/9	..	8 11 6
Telegraph Condenser (10/–)	12/6	7/–	Nil	5	11/3	−⅛	4 9 0
Telegraph Construction	40/–	34/6	10	10	40/–	..	5 0 0
Telephone Mfg. (5/–)	7/6	6/9	9	9	7/3	..	6 4 2
Tube Investments	95/–	89/–	23¾	23¾	93/9	..	5 1 3
Vactric (5/–)	2/3	2/–	4	Nil	2/–	..	—
Vickers (10/–)	16/–	14/–	10	10	15/9	..	6 7 0
Ward & Goldstone (5/–)	19/9	12/6	20	20	16/6	..	5 19 9
Westinghouse Brake	42/6	39/6	17½	10	42/–	..	4 15 1
Walsall Conduits (4/–)	29/–	24/6	55	55	28/9	..	7 12 9
West Allen (5/–)	4/3	3/6	7½	7½	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

Financial Section (*Concluded from page* 819)

to Section 236 of the Companies Act, 1929, on August 12th at 8, Staple Inn, London, W.C.1, to receive an account of the winding-up by the liquidator, Mr. P. J. Chaplin.

Century Refrigeration Co., Ltd.—Particulars of claims by July 14th, to one of the joint liquidators, Mr. H. W. Sydenham, Poyle Manor, Colnbrook, Bucks.

Bankruptcies

E. C. Johnson and J. A. Sheward, electrical contractors, trading as "Edstan Electric," 20, Market Street, Hanley, Stoke-on-Trent and 40, London Road, Newcastle-under-Lyme.—Trustee, Mr. P. M. Milward, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver, released June 20th.

H. J. Brownhill, electrical engineer, 48, Whitehouse Street, and formerly 34, Broadstone Avenue, Leamore, and 181, Bloxwich Road, all Walsall.—Receiving order dated December 18th, 1928, rescinded May 8th, as creditors have been or will be paid their debts in full.

William Cornell (trading as W. T. Cornell), electrical engineer, Holland Street, Kensington, W.—The first meeting of creditors was held on July 1st in London, when accounts were submitted showing liabilities of £354, against assets valued at £199. The debtor took over his late father's business in 1918, and attributes his insolvency entirely to the war. The case was left in the hands of the Official Receiver to be wound up in bankruptcy.

G. H. Morris, electrical engineer, etc., 16, Tontine Street, Folkestone.—Application for discharge to be heard August 5th at the Guildhall, Canterbury.

M. Roscoe, wireless dealer, 40, London Road, Northwich.—Application for discharge to be heard September 5th at the County Police Court, Nantwich Road, Crewe.

J. S. Griffin, electrical engineer, 50, Havelock Road, Luton.—Trustee, Mr. T. Pollitt, Official Receiver, 6, The Parade, Northampton, released June 23rd.

L. Spain, radio and electrical engineer, 376, Bearwood Road, Smethwick.—Trustee, Mr. R. K. Clark, Official Receiver, 37, Temple Street, Birmingham, 2, released June 23rd.

H. Stansfield, electrician, 25, Sunnydale Park, Ossett, Yorks.—Last day for receiving proofs for dividend July 21st. Trustee, Mr. E. T. Sanders, Official Receiver, 71, Manningham Lane, Bradford.

CONTRACT INFORMATION

Tenders Invited and Accepted. Schemes Promising Electrical Work.

Contracts Open

Dundee.—July 14th.—Corporation Public Health Committee. Various works, including electric lighting installation, at Westgreen Mental Hospital. Particulars from the city quantity surveyor, 21, City Square.

Eire.—LURGAN.—July 21st. Urban District Council. One single-stage electric pump (total head 40 ft.); one multi-stage electric pump (static head 200 ft.); one Diesel engine; one alternating set; and four mechanical filters, portable chlorinator, etc. Plan and particulars from J. D. Gordon, engineer, Town Hall, Lurgan.

Kettering.—August 6th. Electricity Department. Oil-immersed transformers. (See this issue.)

New Zealand.—POSTS AND TELEGRAPH DEPARTMENT.—August 13th. Switchboard cords. August 25th. Condensers and three-conductor cords. August 29th. Cadmium-copper binders and tapes. September 1st. Tumbler switches and fuses. September 2nd. 60 tons of copper wire. September 5th. 60 miles of tinned copper wire.

AUCKLAND HARBOUR BOARD.—September 30th. Ten 5-ton electric cranes.

Wokingham.—July 15th. Rural District Council. Supply and installation of electrically operated pumping plant in duplicate, capable of delivering 40,000 gallons per hour from two 18 in. dia. boreholes, in a 6 ft. dia. well, 24 ft. deep. Specification and form of tender from A. P. I. Cotterell & Son, engineers, 54, Victoria Street, Westminster, S.W.1.

Orders Placed

London.—JOINT ELECTRICITY AUTHORITY.—Accepted. New transmission line.—British Insulated Cables.

LEWISHAM.—Emergency Committee. Accepted. Electrical installation at Downham depot (£600).—J. H. Plant, Ltd.

Manchester. Electricity Committee. Accepted. Cable for twelve months: Aberdare Cables, Scottish Cables, Britannic Electric Cable & Construction Co., Lancashire Cables, Connolly's (Blackley), Standard Telephones and Cables, W. T. Glover & Co., British Insulated Cables, Wholesale Fittings Co., L. Andrew & Co., Hackbridge Cable Co., Mersey Cable Works, Enfield Cable Works, and Edison Swan Cables. Renewal of elements of boiler air preheater.—Jas. Howden & Co. (Land). Low-pressure water pipework—Brightside Foundry & Engineering Co. High-pressure water pipes and valves—Babcock & Wilcox. Lagging work—William Kenyon & Sons. 420-V house-service switchgear—Metropolitan-Vickers.

Newcastle (Staffs).—Electricity Committee. Accepted. Repairs to battery (£134).—Alton Battery Co.

Salford.—Light Committee. Recommended. Radio equipment for the police and fire brigade (£3,035).—G.E.C. Switchboard and oil circuit-breakers for sewage works (£1,062).—J. G. Statter & Co.

Swindon. — Electricity Committee. Accepted. Alternator step-up transformer and auxiliary station transformer (£11,182).—Hackbridge Electric Construction Co. Switchgear (£1,297)—B.T.H. Emergency supply switchgear (£1,727) and meter equipment (£105)—Ferguson, Pailin.

York.—Sewage Committee. Recommended. Switchgear for pumping station (£936).—George Ellison, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ancoats.—Canteen at works; Homan & Rodgers, Ltd., constructional engineers, 10, Marsden Street.

Additions to works for metal stamping workshop; B. Drummond, architect, 54, Adelaide Street, Fleetwood.

Bath.—Alterations at Oldfield Schools (£3,600); J. Owens, city engineer, Guildhall.

Batley.—Ambulance garages for West Riding C.C.; county architect, County Hall, Wakefield.

Billingham-on-Tees.—British Restaurants, community kitchen near the station, and improvements at the Hostel, for U.D.C.; surveyor, Council Offices, Haverton Hill, Middlesbrough.

Bournemouth.—Office additions, Stourvale Road; Bolloms of Bristol, Ltd.

Coventry.—Rebuilding Barracks Square Market, for T.C.; D. E. Gibson, city architect, 1A, Warwick Row.

Dundee.—Additions and alterations at garage premises, East Dock Street; David Barrie, Ltd.

Additions to timber store, Loons Road; M'Gregor & Balfour, Ltd.

Durham.—Provision of feeding facilities at 16 secondary schools for the E.C. (£14,000); F. Willey, county architect, 34, Old Elvet, Durham.

Ealing.—Storage buildings, Western Avenue; Wallis Gilbert & Partners, architects, 151, Friern Barnet Lane, Whetstone.

Millinery store, 66, The Broadway; Hall-Jones & Partners, architects, 51, The Mall, W.5.

Eire.—Houses (52), Dalkey, for Dun Laoghaire T.C.; T. C. O'Mahony, borough manager, Town Hall, Dun Laoghaire (Kingstown).

Essex.—Medical officers' quarters at Oldchurch Hospital, Romford, for C.C.; J. Stuart, county architect, County Hall, Chelmsford.

Eynsford.—Sinking borehole and provision of building and machinery (£7,600); Metropolitan Water Board, 173, Rosebery Avenue, London, E.C.1.

Glasgow.—Canteen, Shieldhall Wharf; Gyproc Products, Ltd.

Guildford.—Canteen at Northmead School (£1,180), for E.C.; borough engineer, Municipal Offices, High Street.

Halifax.—Adaptation of Craigie Lea, for day nursery, for T.C.; D. T. Lloyd Jones, borough engineer, Crossley Street.

Harrow.—Adaptation of premises, Honeypot Lane, as communal feeding centre (£1,600); Surveyor, Council Offices, Uxbridge Road, Stanmore.

Hinckley.—Canteen at works; Burgess Products Co., Ltd., Brookfield Road.

Hull.—Hutments for homeless persons, for Welfare Committee; city engineer, The Guildhall.

Shop & offices, Prospect Street; Yorkshire Decorative Materials Supply Co.

Hurst.—Works buildings, Alger Mills; A. Pattreiouex, Ltd., tobacco manufacturers, Derby Street, Cheetham, Manchester.

Kettering.—Additions and alterations, Victoria Street and York Road; Upsons, Ltd.

London. — SYDENHAM. — Additions, 141 Sangley Road; H. Woodham & Sons, Ltd.

Luton.—Auxiliary fire station, control room and garages, for T.C.; F. Oliver, borough engineer, Town Hall.

Manchester.—Showrooms and works, "Olympia," Knott Mill; T. Garner, automobile engineer, 10-12, Peter Street.

Extensions, knitting machine factory; Matley, Brotherton & Mills, architects, 39, Oxford Street.

Middlesbrough.—Offices, coal depot, etc., Lower High Street, for A. Smith & Sons; E. R. Allan, architect.

Newcastle - on - Tyne. — Decontamination station (£5,644), for T.C.; P. Parr, city engineer, Municipal Offices, Town Hall.

Hostels for country works; E. M. Lawson, Barras Buildings, Barras Bridge; P. L. Browne, Son, & Harding, Pearl Buildings; and Marshall, Tweedy & Bourne, 36, Blackett Street.

Northampton. — Extensions, General Hospital, Billing Road; Governors.

Canteen; Northampton Machinery Co., Ltd.

Openshaw.—Dining room at works; J. H. Lang, architect, 54, St. Thomas' Road, St. Annes-on-Sea.

Rawtenstall.—Bus station and car park, Bury Road, for T.C.; borough engineer, Municipal Offices.

Romford.—Enlargement of children's nursery and feeding centre at Collier Row, for T.C.; borough surveyor, 8, Hall Road.

Rotherham.—Canteen, Bridge Street; Forge & Rolling Mills Co., Ltd.

Scissett.—Alterations and adaptations at Nortonthorpe Hall (£6,000), for West Riding E.C.; county architect, County Hall, Wakefield.

Shotton (co. Durham).—Conversion of premises in Office Row into library for Durham C.C.; county architect, 34, Old Elvet, Durham.